

90-NET

UNINTERRUPTIBLE POWER SYSTEM

Restricted Sales Distribution



Warning: This is a product for Restricted Sales Distribution to informed partners. The UPS may give rise to radio-frequency interference affecting other equipment in the vicinity; it is advised that the UPS not be positioned next to devices which, by their nature, are sensitive to such interference (receivers/transmitters, radar, metal detectors, anti-theft systems) and that cabling of such devices be kept separate from that of the UPS wherever possible. It is also advised that the UPS input, output and external battery cables be housed in earthed, metal conduits, or that shielded cables be used.



All rights, including rights of translation, reproduction by printing, copying or similar methods, even of parts, are reserved.

Offenders will be liable for damages.

All rights, including rights created by patent grant or registration of utility model or design, are reserved.

Delivery subject to availability. Right of technical modification reserved.

90-NET may differ from the one displayed on the front cover.

Copyright © Chloride, 2008

1. About these operation instructions	9
2. Safety	11
3. Equipment delivery and storage	13
3.1. Transportation	13
3.2. Storage.....	13
4. Installation preparations	17
4.1. Unpacking	17
4.2. Transporting without packaging materials	17
4.3. Selecting an installation site.....	17
4.4. Placement	18
5. Installation	19
5.1. Installation data	19
6. Power and signal connections.....	33
6.1. Power connections	33
6.2. Cable lengths	35
6.3. Backfeed Protection.....	35
6.4. 60-80kVA UPS power connections	36
6.5. 100-120kVA UPS power connections	37
6.6. 160-200kVA power connections	39
6.7. 250/300kVA UPS power connections	40
6.8. 400kVA UPS power connections	41
6.9. 500kVA UPS power and signal connections	42
6.10. 600/800kVA power and signal connections	43
6.11. Signal connections	47
6.12. Individual UPS signal connection information	48
7. Battery connections.....	49
7.1. Battery cabinet connections.....	50
7.2. Battery calculation settings	53
8. Parallel.....	55
8.1. Installation - COC	55
8.2. Power and signal connections - COC.....	59
8.3. COC power connection data.....	60
8.4. 400/800A COC Power connections	61
8.5. 1600A COC Power connections	62
8.6. 3200A COC Power connections	63
8.7. Parallel signal connections	64
9. System description	71
9.1. Function	71
9.2. Special features	73

9.3. Block diagram	74
9.4. Switch positions and corresponding operating modes	74
9.5. Operating modes	75
9.6. Protection devices	81
10. Operation.....	83
10.1. Control Panel and display.....	83
10.2. Inverter STOP/START procedures	84
10.3. Controls and messages	86
10.4. Warning and Fault indications.....	91
10.5. Troubleshooting	94
11. COC control panel.....	95
11.1. Control panel.....	96
11.2. 90-net diagnostics for parallel system with COC.....	96
11.3. COC messages normal condition	97
11.4. Description of COC system stages	102
11.5. COC RESERVE stage description	104
11.6. COC UPS stage description	105
11.7. LOAD stage description.....	106
12. Operating procedures	107
12.1. Sample guided procedure - Manual Bypass	108
12.2. Centralised parallel system	112
12.3. Parallel operation	119
12.4. Guided procedure	120
13. I/O functions	125
13.1. List of Individual functions for single and modular parallel UPS	125
13.2. List of individual COC functions.....	127
13.3. I/O Function setting via PC terminal	128
13.4. Description of function wiring with fixed terminal assignments.....	132
13.5. Electrical specifications of input/output signals	134
13.6. Table of functions	135
13.7. I/O functions using interfaces X7 and X8.....	138
14. Interfaces.....	141
14.1. Standard interface COM - X6.....	142
14.2. Computer Relay Interface - X7.....	142
14.3. PPVis configured service interface - X3	142
14.4. X8 - Load Isolating Device (option).....	142
15. Standard equipment	143
15.1. Device parameter special setting	143
15.2. Battery parameter setting.....	143

15.3. Special colour	143
15.4. Further accessories.....	143
15.5. PPVis	143
16. Options	145
16.1. Remote alarm unit.....	145
16.2. External battery circuit breaker	145
16.3. Additional RFI filters (only upon request)	145
16.4. IP 31 with air filter cartridge	145
16.5. Battery leakage alarm.....	145
16.6. Battery Management Modules (only upon request)	145
16.7. Isolation transformer	145
16.8. Top cable entry	145
16.9. Dust filters	145
16.10. Input harmonic filters for 6 pulse versions (only upon request)	146
16.11. 12 Pulse rectifier	146
16.12. Multiple Bus Synchronization Module (MBSM)	146
16.13. Empty battery cubicle	146
16.14. Battery cubicles	147
16.15. Empty options cubicle.....	147
16.16. Customer interface board	147
16.17. Telephone switch for LIFE.net.....	147
16.18. MopUPS Shutdown and monitoring software	147
16.19. ManageUPS adapter	147
16.20. PPVIS surveys Monitoring Software	148
16.21. Compatibility Table.....	148
16.22. J-Bus protocol	148
16.23. Profi Bus protocol	148
17. Maintenance	149
17.1. Maintenance intervals	149
17.2. Service addresses	149
18. Environmental compatibility, disposal	151
18.1. Environmental concerns during development.....	151
18.2. Environmental concerns during production.....	151
18.3. Environmental concerns for disposal	151

Fig. 1 - Transporting the UPS	14
Fig. 2 - Width between forks.....	15
Fig. 3 - Permissible load dependent on installation altitude	18
Fig. 4 - Dimensions of UPS rating 60 and 80kVA	20
Fig. 5 - Dimensions of UPS rating 100 and 120kVA	21
Fig. 6 - Dimensions of UPS ratings 160 and 200kVA	22
Fig. 7 - Dimensions of UPS ratings 250, 300 and 400kVA	23
Fig. 8 - Roof - 250/300/400kVA	24
Fig. 9 - Dimensions of UPS rating 500kVA.....	25
Fig. 10 - Dimensions of UPS ratings 600/800kVA	26
Fig. 11 - Cubicle footprint - 60 - 120kVA.....	27
Fig. 12 - Cubicle footprint - 160 - 200kVA.....	28
Fig. 13 - Cubicle footprint - 250/300/400kVA.....	29
Fig. 14 - Cubicle footprint 500kVA.....	30
Fig. 15 - Cubicle footprint - 600/800kVA.....	31
Fig. 16 - Two mains supplies.....	35
Fig. 17 - 60-80kVA UPS connections.....	36
Fig. 18 - 100kVA UPS connections.....	37
Fig. 19 - 120kVA UPS connections.....	38
Fig. 20 - 160-200kVA UPS connections.....	39
Fig. 21 - 250/300UPS connections	40
Fig. 22 - 400kVA UPS connections.....	41
Fig. 23 - 500kVA UPS power connections	42
Fig. 24 - 600/800kVA power connections - Input cubicle	43
Fig. 25 - 600/800kVA power connections - Output cubicle	44
Fig. 26 - Output cubicle connection points.....	45
Fig. 27 - Plaited power cables	46
Fig. 28 - Installing the lexan power connection protective panels.....	46
Fig. 29 - Battery connection diagram	51
Fig. 30 - Dimensions of COC rating 400/800A	56
Fig. 31 - Dimensions of COC rating 1600A	57
Fig. 32 - Dimensions of COC rating 3200A	58
Fig. 33 - COC 400/800A	61
Fig. 34 - COC 1600A	62
Fig. 35 - COC 3200A	63
Fig. 36 - POB mounting location	65
Fig. 37 - POB interconnection diagram	66
Fig. 38 - Inserting the shielding clamp.....	66
Fig. 39 - Removing the shielding clamp	66
Fig. 40 - Connections and loop circuit (25-pin plug) for example 4-block system	67
Fig. 41 - UPS On-line Double Conversion operation.....	71
Fig. 42 - Overview UPS components	74
Fig. 43 - Power flow in on-line operation.....	75
Fig. 44 - Power flow in battery operation	75
Fig. 45 - Power flow in reserve operation	76
Fig. 46 - Power flow in service bypass operation.....	76
Fig. 47 - Power flow during battery test.....	76
Fig. 48 - Power flow in frequency converter operation	77
Fig. 49 - Centralised parallel system electrical connections - 400/800A.....	77
Fig. 50 - Centralised parallel system electrical connections - 1600/3200A.....	78
Fig. 51 - Centralised parallel system electrical connections	79
Fig. 52 - Distributed parallel system electrical connections	80
Fig. 53 - Control Panel	85
Fig. 54 - System block, main- and submenus	86
Fig. 55 - COC control panel	95
Fig. 56 - Connections for modular parallel system	119
Fig. 57 - PPVis - page [3] Contacts	138
Fig. 58 - Connectivity panel.....	141
Fig. 59 - Location of connectivity panel.....	141

1. ABOUT THESE OPERATION INSTRUCTIONS

Who are these operating instructions intended for?

These operating instructions are intended for use by qualified personnel involved in the transport, installation, commissioning, maintenance and operation of the 90-NET devices.

Symbols used

The following symbols are used in this handbook:



Danger

As defined by these operating instructions and the danger notices on the products. Failure to observe the appropriate safety measures will result in death, severe injury or considerable damage to property.



Warning

As defined by these operating instructions and the warning notices on the products. Failure to carry out described operations or observe proper precautions may result in death, severe injury or considerable damage to property.



Notice

This pictogram draws attention to important information about the product or part of the operating instructions.



Indicates a step that must be carried out

Terms used

Maintenance bypass

The switch that allows maintenance work to be carried out without interrupting the supply to the load.

Electronic bypass

A thyristor switch which connects the load directly to mains in event of inverter overload; also referred to as a static switch or static bypass.

Qualified personnel

Personnel who are familiar with the installation, assembly, commissioning and operation of the product and are qualified to carry out the respective activities.

Display

An LCD display, providing information about the operating status of the UPS.

EC Declaration of Conformity

The 90-NET System (UPS device with battery cabinet) is in conformity with the protection and safety objectives of the following European directives:

2006/95/EC

Directive of the council for adaptation of the legal regulations of the member states regarding electrical equipment for use within specific voltage limits (superseding the 73/23/EC and successive amendments).

89/336/EC

Directive of the council for adaptation of the legal regulations of the member states regarding electromagnetic compatibility, modified by directive 91/263/EC, 92/31/EC and 93/68/EC.

Conformity is established through compliance with the following standards:

- EN 62040-1-2
- EN 50091-2
- IEC/EN 62040-3

2. SAFETY

Intended use

This device serves as an uninterruptible power supply for connected loads. It complies with all relevant safety regulations governing information technology equipment.



Notice

This UPS may only be installed in closed operating areas. If the area contains or if there is present in the area, any equipment containing in excess of 25 litres of inflammable liquids, refer to HD 384.4.42 S1 A2, chapter 42 (corresponds to DIN VDE 0100, Part 420), it must be ensured that burning liquids or their combustion products cannot spread through the building.

Safety Notices



Carefully read the following safety notices!



Warning

Dangerous voltages are present within the device when in operation, failure to comply with the warning notices may result in death, severe injury, or considerable damage to property. It is important to note, also, that when the EPO (Emergency Power Off) is in operation, i.e. the unit has been automatically switched off due to some dangerous fault condition, battery power is still present within the UPS. This device must be installed, connected, commissioned, maintained and repaired by qualified personnel. These personnel must be familiar with all repair and maintenance tasks described in these operating instructions. Error-free and safe operation of this device requires proper transport, storage, placement, installation and connection, as well as careful operation and maintenance.



Danger

Mains over-voltage: this UPS must be protected against over-voltages deriving from the mains supply. The device was developed in accordance with the product normative EN 50091-2, which relates to the IEC 1000-4-5. Over-voltages must be planned for in the power supply system, including those caused by lightning strikes as well as those produced internally as the result of switching inductive or capacitive loads, such as power transformers or capacitor banks, or as the result of short-circuit shutdowns.



In addition to the warning notices given in the respective sections, pay particular attention to the following notices:

- When selecting a location for the device and before operation, observe the notices concerning environmental conditions.
- When disconnecting the mains voltage, the connected loads continue to be supplied with voltage by the battery, and return voltage is present at the input terminals of the UPS.
- During thunderstorms, data transfer cables must not be connected or disconnected.
- Ensure that no objects (e.g. drilling chips, screws etc.) are left inside of the device.

Emergency measures



In order to conform to the European Standard EN62040-1-2 (par. 5.3) , a UPS must be fitted with an Emergency Power Off device (E.P.O.) that can be used to shut down the unit completely in the event of an emergency. 90-NET is equipped with a dedicated user input which is default configured to execute the EPO function. Refer to "Individual UPS signal connection information" on page 48 for instructions on how to install an E.P.O. button on this UPS.



In the event of an emergency, press the EPO button immediately in order to shut down the entire system.

If, for any reason, the EPO fails to switch off the UPS, proceed as follows:

- Open the external mains separation device
- Switch off the load
- NEVER ATTEMPT TO OPEN OR CLOSE THE UPS BATTERY SWITCH UNDER EMERGENCY CONDITIONS
- In case of fire, call the emergency personnel/fire brigade, who must put out any flames using an extinguisher appropriate to the batteries in use
- NEVER ATTEMPT TO EXTINGUISH A FIRE USING WATER AS BATTERIES CARRY LIVE VOLTAGE AT ALL TIMES

Danger Areas

For reasons of safety the Operator MUST NOT REMOVE the secondary access panel.

If, for any reason, it is necessary to remove this panel, the installation must be switched off and de-energised, otherwise complete safety cannot be guaranteed.

When the UPS is closed, parts which carry voltage must not be touched. After removing the protective panels or terminal field covering, the connection terminals and rails, as well as exposed metal parts and other components carrying dangerous voltages are no longer protected against accidental contact!

When working on an open UPS device, the corresponding safety measures must be observed. The following danger is present even with disconnected UPS:



Danger

The UPS contains capacitors which continue to store energy for a period of time after the device has been disconnected from the mains supplies and battery. This voltage (> 500 V DC) is present at battery terminals C+ and D-. For this reason, check that the UPS and the external mains separation device are switched off and the battery fuses removed. Before continuing work, measure the voltage at the battery terminals and at the mains input filter and wait until this has dropped to 0 V. Failure to do this can lead to severe electrical shock and even death.



Warning

The UPS battery switch is equipped with an electro-mechanical interlock, however, we recommend that YOU CHECK THAT THE POLARITY IS CORRECT!



Notice

90-NET has been designed for installation in TN-S and TN-C systems. Please contact your distributor if you are uncertain about your installation.

For installation in permanent IT systems please contact CHLORIDE Technical Support.

3. EQUIPMENT DELIVERY AND STORAGE

3.1. Transportation



Warning

Pay attention to the markings indicating the centre of gravity of the device. Use suitable means of transportation and secure the UPS against tipping over when transporting. Improper transportation can result in damage to the UPS and battery cabinet as well as injury to personnel.

All UPS cabinets are delivered on transport pallets:

- 60/80 kVA
Transport pallet 980 x 1000 mm (w x d). The pallet raises the UPS device by approx. 210 mm.
- 100/120 kVA
Transport pallet 1200 x 1000 mm (w x d). The pallet raises the UPS device by approx. 210 mm.
- 160/200 kVA
Transport pallet 1595 x 1000 mm (w x d). The pallet raises the UPS device by approx. 200 mm.
- 250/300/400 kVA
Transport pallet 1795 x 1000 mm (w x d). The pallet raises the UPS device by approx. 200 mm.
- 500 kVA
Transport pallet 2200 x 1000 mm (w x d). The pallet raises the UPS device by approx. 200 mm.
- 600/800 kVA
Input cubicle: Transport pallets 1795 x 1000 mm (w x d). The pallet raises the UPS device by approx. 200 mm.
Output cubicle: Transport pallets 1795 x 1000 mm (w x d). The pallet raises the UPS device by approx. 200 mm.
- COC 400/800 A
Transport pallet 1200 x 1010 mm (w x d). The pallet raises the UPS device by approx. 210 mm.
- COC 1600 A
Transport pallet 980 x 1010 mm (w x d). The pallet raises the UPS device by approx. 210 mm.
- COC 3200 A
Transport pallet 1200 x 1010 mm (w x d). The pallet raises the UPS device by approx. 210 mm.



Transport the UPS and battery cabinets to the storage or installation site on the pallet in the original packaging, using a suitable lifting truck or crane, (see Fig. 1 and Fig. 2), if a crane is used, insert lifting beams to ensure the unit is not damaged (see step "a").

When moving the 250/300/400 and 500kVA ratings it is possible to use two forklifts, inserting one at each side.

In the case of the 250/300/400/600/800kVA ratings there are two central feet (see Fig. 13 - on page 29 and Fig. 15 - on page 31) which may obstruct the forks. (See Table 1 on page 15).

In the case of the 500kVA there is a continuous foot in the middle of the cabinet (see Fig. 13 - on page 29) which may obstruct the forks. (See Table 1 on page 15).

3.2. Storage

If the UPS and battery cabinets are not to be installed immediately, they may be kept in storage. Observe the following:

- Store the UPS and battery cabinets in their original packaging.
- The storage conditions described in the appendix must be observed.
- Batteries must be recharged at least once every three months. If battery cabinets are to be stored for longer than three months before installation, ensure that they are recharged regularly during this period.
- Pay attention to the times given for recharging the batteries. These values are given on a sticker on the device or on the packaging.

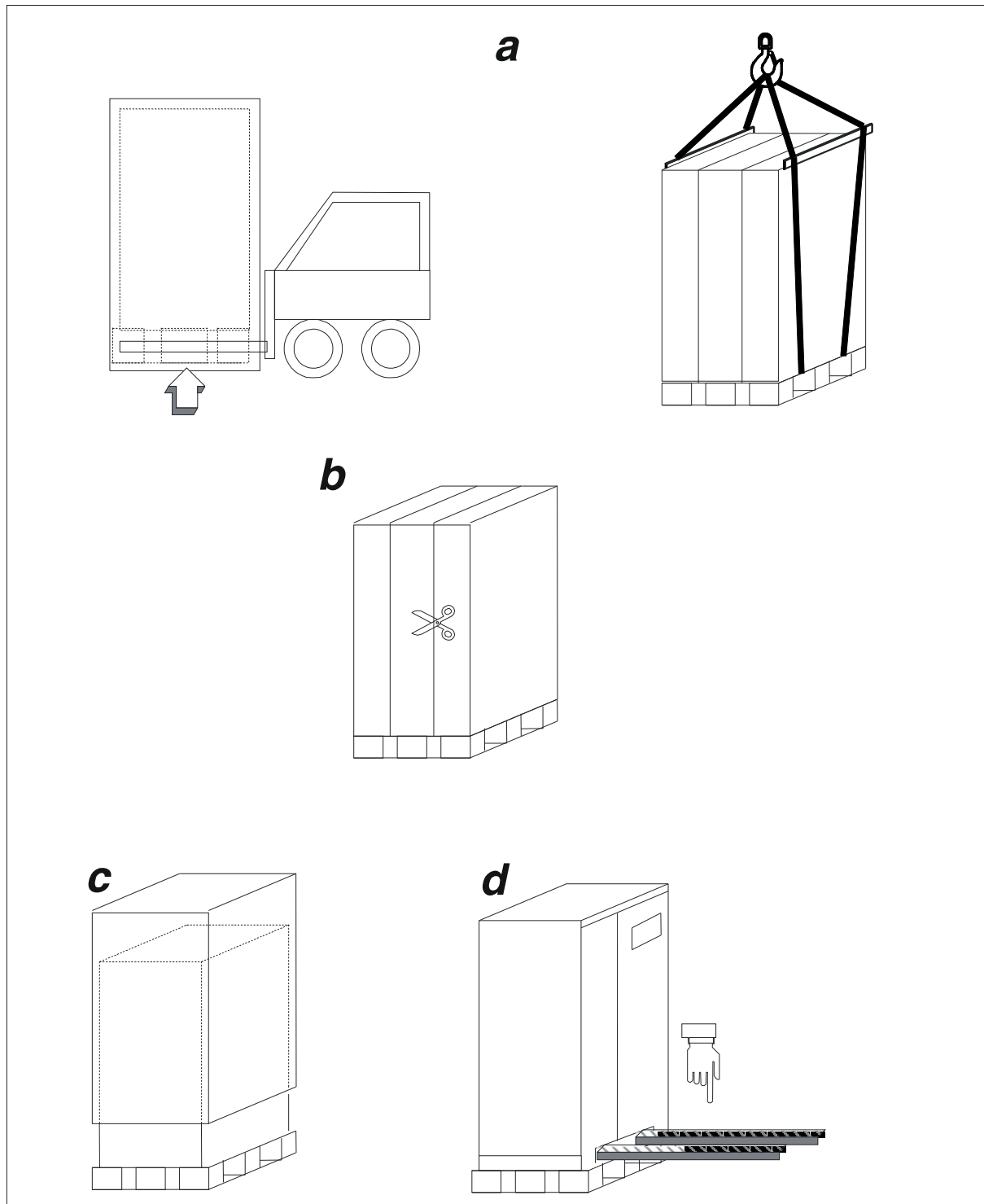
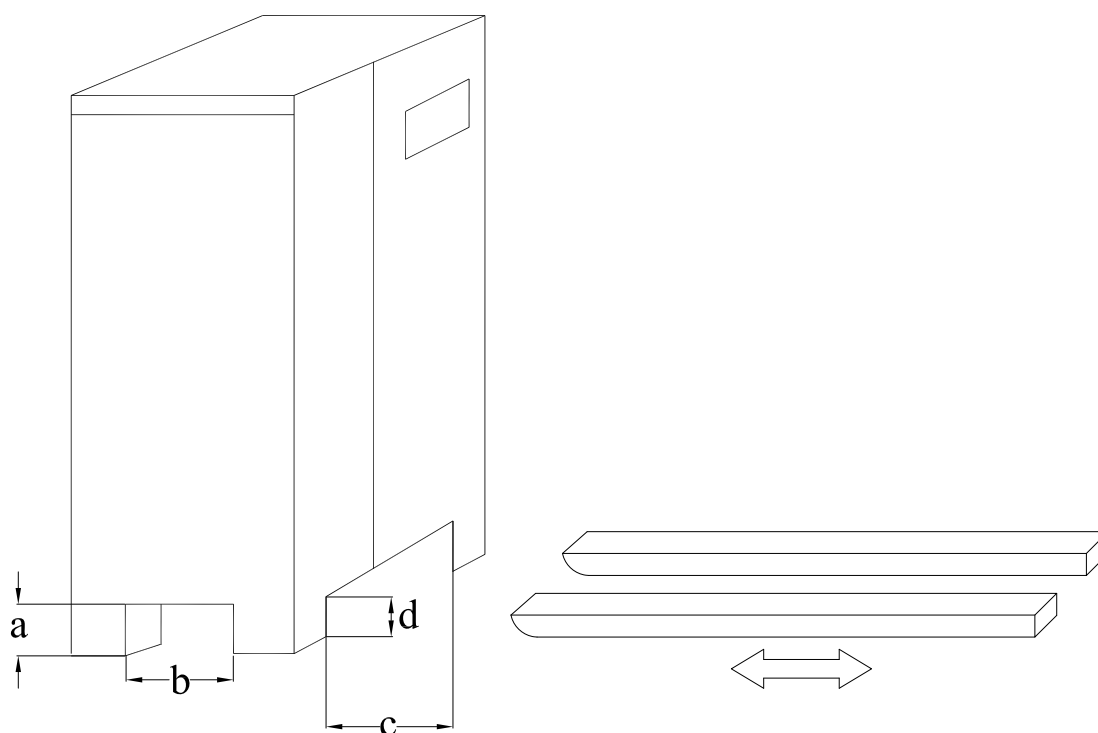
Figure 1 - Transporting the UPS

Figure 2 - Width between forks

**Table 1: Forklift clearance dimensions**

max dimensions of	UPS Model (kVA)						COC Ratings (A)	
	60/ 80	100/ 120	160/ 200	250/300/ 400	500	600/800 ^{a)}	400/ 800	1600
a (mm)	150	150	150	150	100 ^{b)}	150	150	150
b ^{c)} (mm)	560	560	560	600	560	600	600	560
c ^{d)} (mm)	585	785	1160	1300	1600 (770 + 770) ^{e)}	1300	700	585
d (mm)	150	150	150	150	150	150	150	150

- a) The 600/800 ratings consist of two cubicles, the measurements refer to the individual cubicles.
- b) Note lower forklift clearance than for other ratings.
- c) For 60 - 200kVA ratings pay attention to the centre foot when inserting the forks (see Fig. 11 - on page 27).
For 250/300/400 and 500kVA ratings, two forklifts must be used, paying attention to the supports under the centre of the unit when inserting the forks (see Fig. 13 - on page 29 and Fig. 14 - on page 30).
- d) For 250/300/400/500/600 and 800kVA ratings pay attention to the supports under the centre of the unit when inserting the forks (see Fig. 13 - on page 29 and Fig. 14 - on page 30).
- e) If at all possible, the UPS should be lifted by inserting the forks at the side (b); if it is necessary to lift it by inserting the forks at the front or rear, **open the front panels to avoid bending them**. When lifting from the front or rear, use adjustable width forks, or two forklifts - do not attempt to lift using a single, fixed-width forklift.

4. INSTALLATION PREPARATIONS

4.1. Unpacking

**Notice**

The device should be unpacked at the installation site since the packaging provides additional protection during transportation

**Unpack the device as follows:**

- Check the UPS and battery cabinet for physical damage and in the event of problems, inform the forwarding agent and if necessary, your CHLORIDE agent.
- Check the nameplates on the UPS and battery cabinet against the delivery papers and your order. The nameplate can be viewed with front door open. It is also attached to the packaging.
- Loosen the fastening screws on the pallet.
- Slowly lift the cabinets from the pallet; depending on the weight 2 or 3 people should be at hand (see Fig. 1 and Fig. 2).
- Keep the pallet for repackaging or transportation at a later time.



Dispose of the remaining packaging material in accordance with local regulations

4.2. Transporting without packaging materials

The cabinets can easily be moved to their final destinations with lifting devices.

**Warning**

Stones, or irregularities in the floor can block the fork lift. Moving the cabinets too quickly can damage them, causing them to fall over and injure personnel.

4.3. Selecting an installation site

Pay attention to the following conditions when selecting an installation site:

**Notice**

This UPS must only be installed in closed operating areas. If the area contains, or if there is present in the area, any equipment containing in excess of 25 litres of inflammable fluids, refer to HD 384.4.42 S1 A2, chapter 42 (corresponds to DIN VDE 0100, Part 420), it must be ensured that burning fluids or their combustion products cannot spread through the building.

4.3.1. Ambient temperature

The ambient temperature should be between 0°C and +40°C for UPS devices. For continuous operation at temperatures up to a maximum of +50°C, the maximum load must be reduced by 12 % of the nominal load per 5°C.

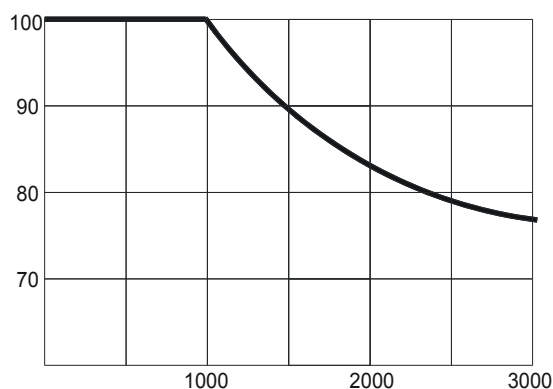
The ambient temperature should be between +15°C and +25°C for battery cabinets.



Be sure to provide sufficient cooling of the installation room so that the ambient temperature remains within the stated limits. The heat emission ratings of the UPS are given in the Appendix. Be sure also to provide sufficient ventilation for the type of batteries used in the UPS.

4.3.2. Installation altitude

When operating the 90-NET UPS at altitudes above 1000m a.s.l., the load must be reduced in accordance with Fig. 3. If the ambient temperature remains less than +30°C, no load reduction is necessary for altitudes up to 2000 m.

Figure 3 - Permissible load dependent on installation altitude

4.3.3. Floor

Be sure that the load carrying capacity of the floor is sufficient for the UPS and batteries. The floor must be even and level.

4.3.4. Environmental conditions

Avoid harmful environmental conditions such as:

- vibration
- dust
- corrosive atmospheres
- high humidity

4.3.5. Space requirements

Provide the following minimum distances:

- minimum of 50 cm between the top of the cabinet and the roof
- no wall-distance if the cable is run through a double floor, otherwise the wall-distance must be at least equal to the bending radius of the cables in use. The distance between covering parts and floor is 150 mm.
- no limitations on either side of the device

4.4. Placement



Danger

Whenever the devices are moved they must be secured against sideways tipping

5. INSTALLATION

5.1. Installation data

- Ambient temperature.....0 + 40°C
- Relative humidity (w/o condensation @ 20°C)..... 90%
- Max. altitude (w/o derating) 1000 m.a.s.l.
- Protection degree (with doors open)..... IP20
- Cable entry bottom or side
- Air inlet.....bottom
- Air outlet.....top

Table 2: UPS installation data

Description	U.M.	UPS Ratings kVA					
		60	80	100	120		160 200
Dimensions see: on page		Fig. 4 20		Fig. 5 21			Fig. 6 22
Net weight (6 step)	kg	554±35		630±35	725±35		1100±35
Net weight (12 step)	kg	780±35		925±35	1011±35		1504±35
Floor loading (6 step)	kg/m ²	930		770	875		940
Floor loading (12 step)	kg/m ²	1330		1125	1230		1320
Nominal air flow of fans	m ³ /h	1200			1800		2400
Max. dissipation (@nominal load and battery recharging)	(kW)	4.4	5.8	6.8	8.1		10 12.6
	(kcal/h)	3786	4990	5851	6969		8604 10842
Max. audible noise level (@1m)	dBA	62			64		65

Description	U.M.	UPS Ratings kVA					
		250	300	400	500		600 800
Dimensions see: on page		Fig. 7 and Fig. 8 23 and 24			Fig. 9 25		Fig. 10 26
Net weight (12 step)	kg	1920±35		2155±35	2575±35	I/P	2010±35
						O/P	1955±35
Floor loading (12 step)	kg/m ²	1455		1640	1560	I/P	1530
						O/P	1570
Nominal air flow of fans	m ³ /h	3600		4800	6000		11400
Max. dissipation (@nominal load and battery recharging)	(kW)	18.7	21.1	27.9	34.8		45.6 60.8
	(kcal/h)	16086	18156	24006	29940		39230 52305
Max. audible noise level (@1m)	dBA	68		70	72		75

STANDARD FINISH: LIGHT GREY RAL 7035

Figure 4 - Dimensions of UPS rating 60 and 80kVA

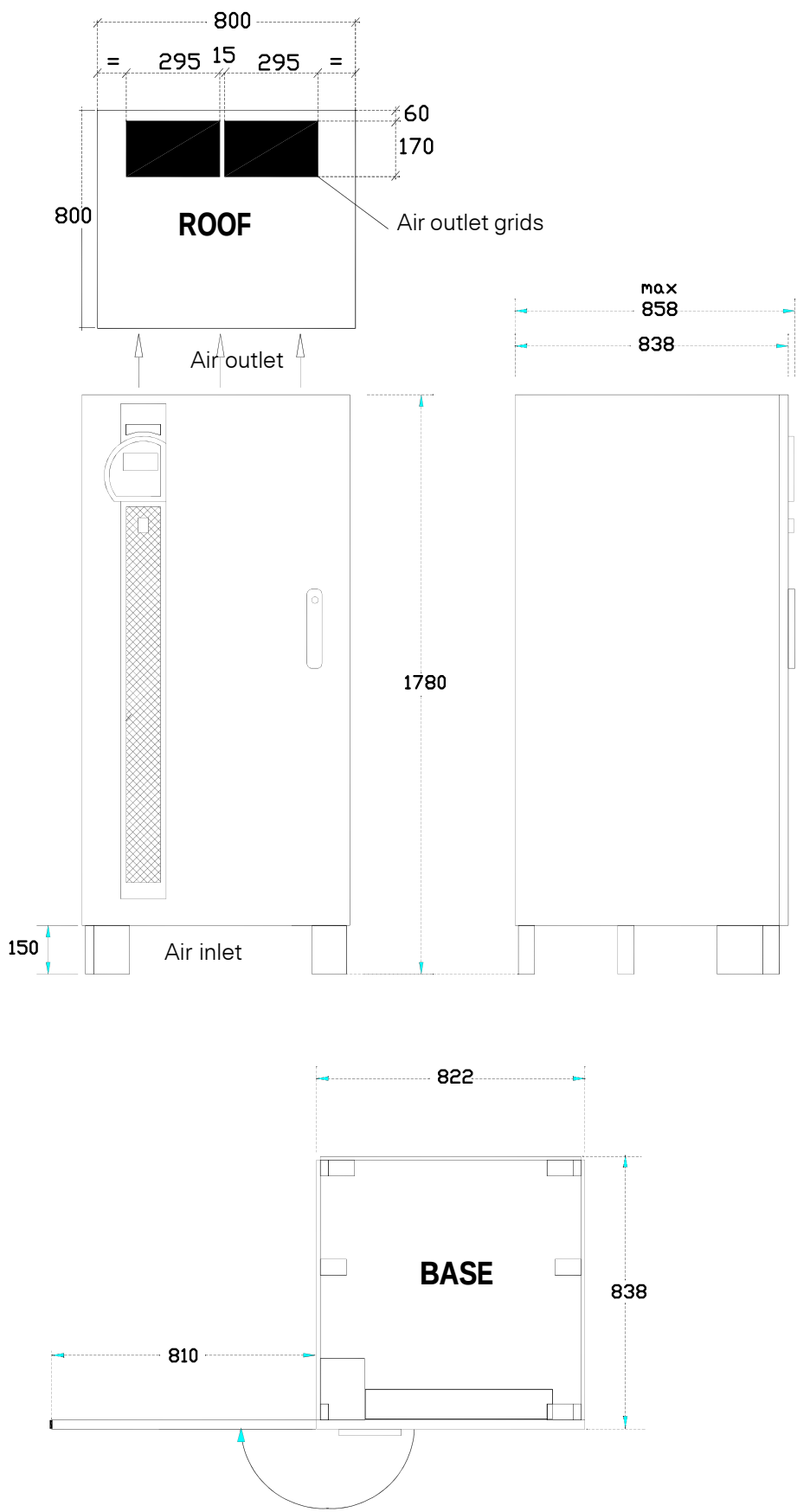


Figure 5 - Dimensions of UPS rating 100 and 120kVA

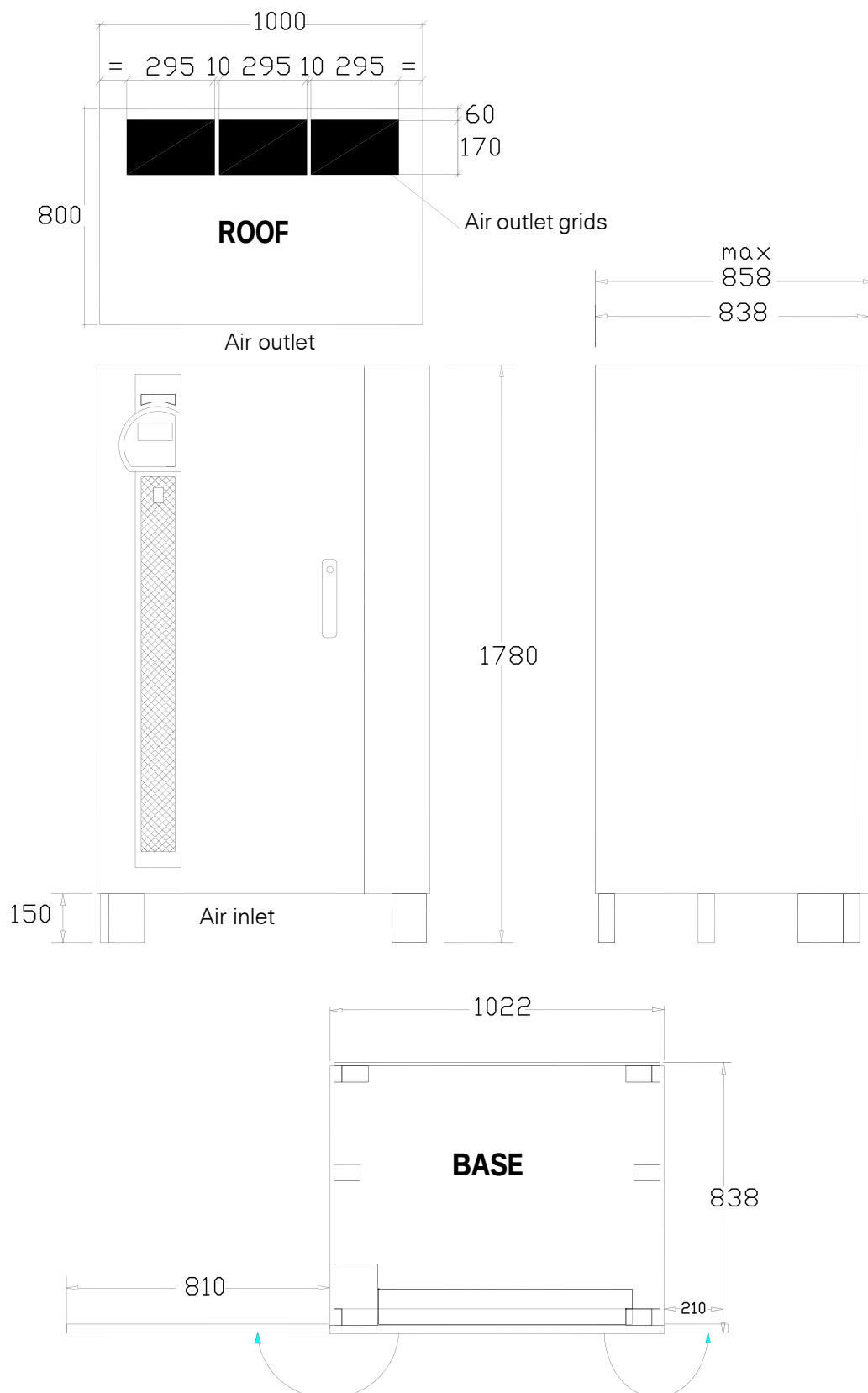


Figure 6 - Dimensions of UPS ratings 160 and 200kVA

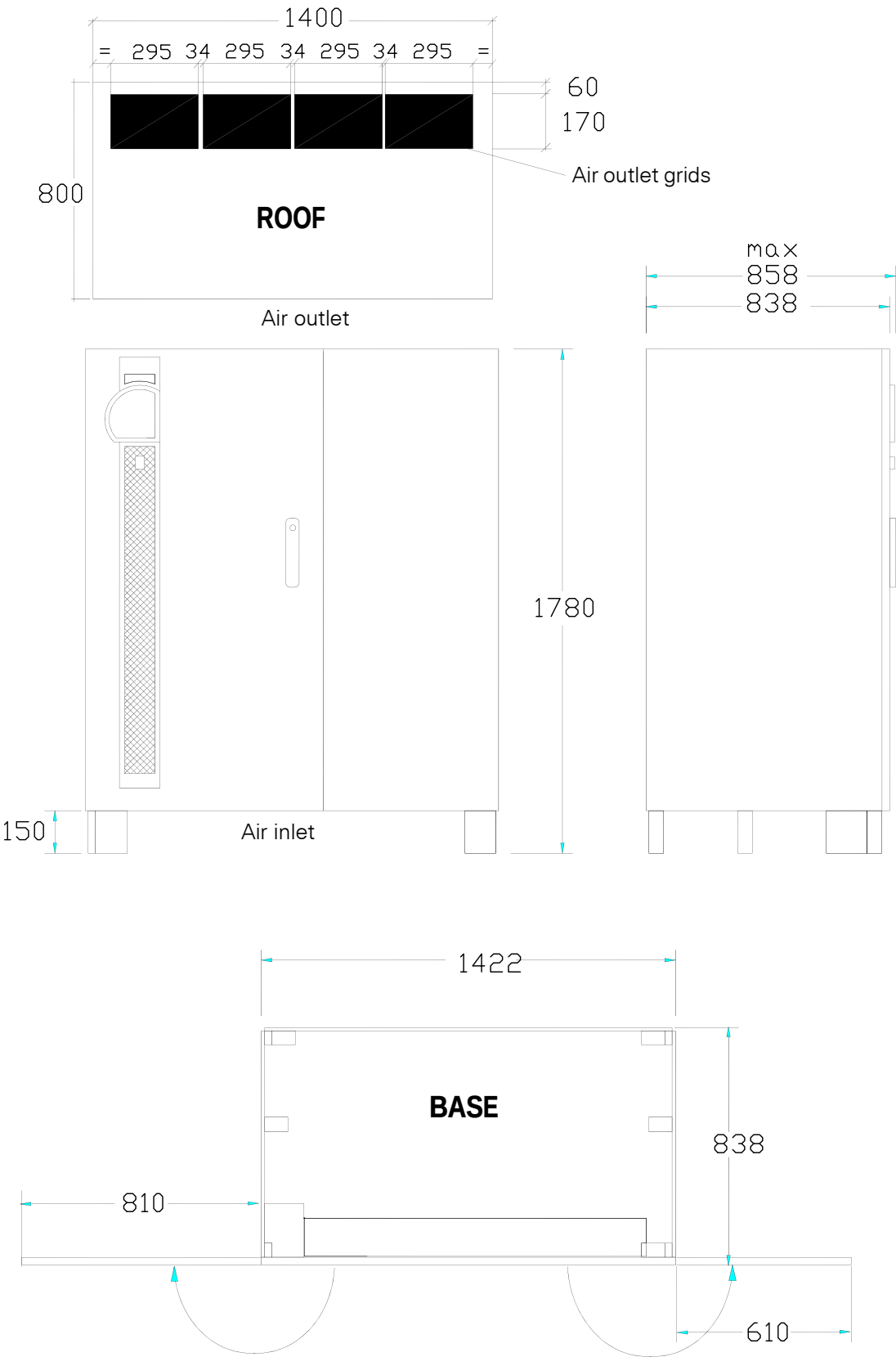


Figure 7 - Dimensions of UPS ratings 250, 300 and 400kVA

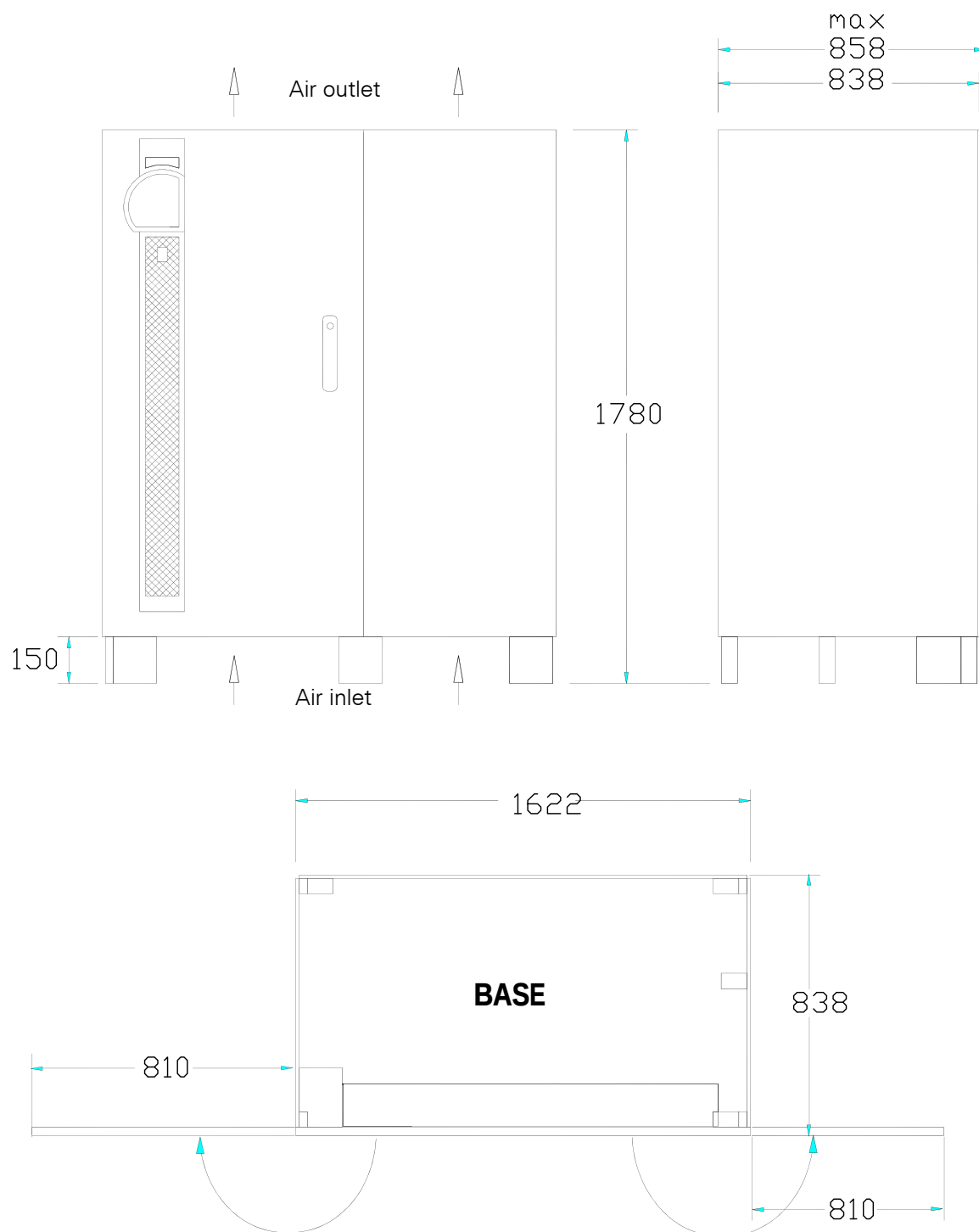


Figure 8 - Roof - 250/300/400kVA

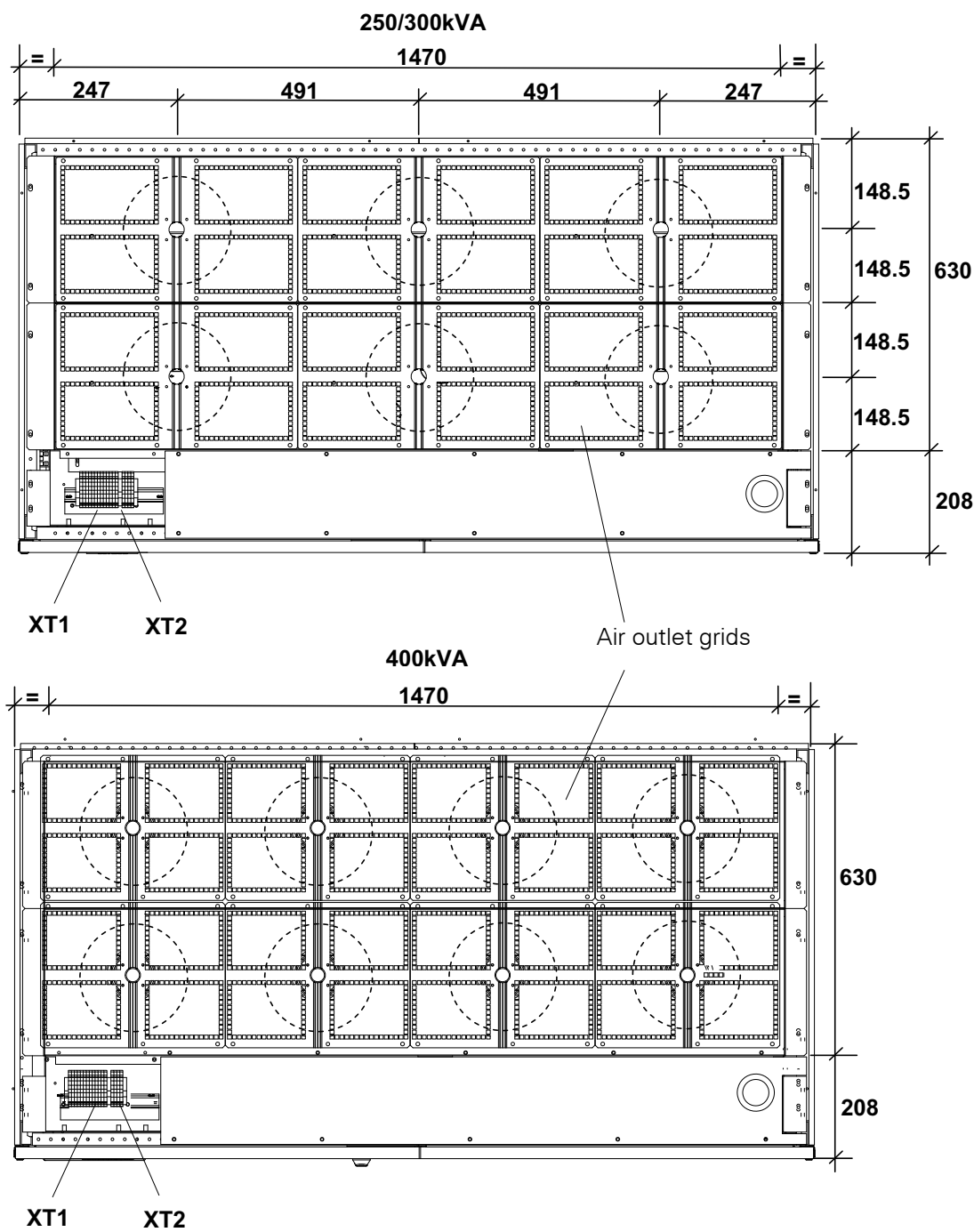


Figure 9 - Dimensions of UPS rating 500kVA

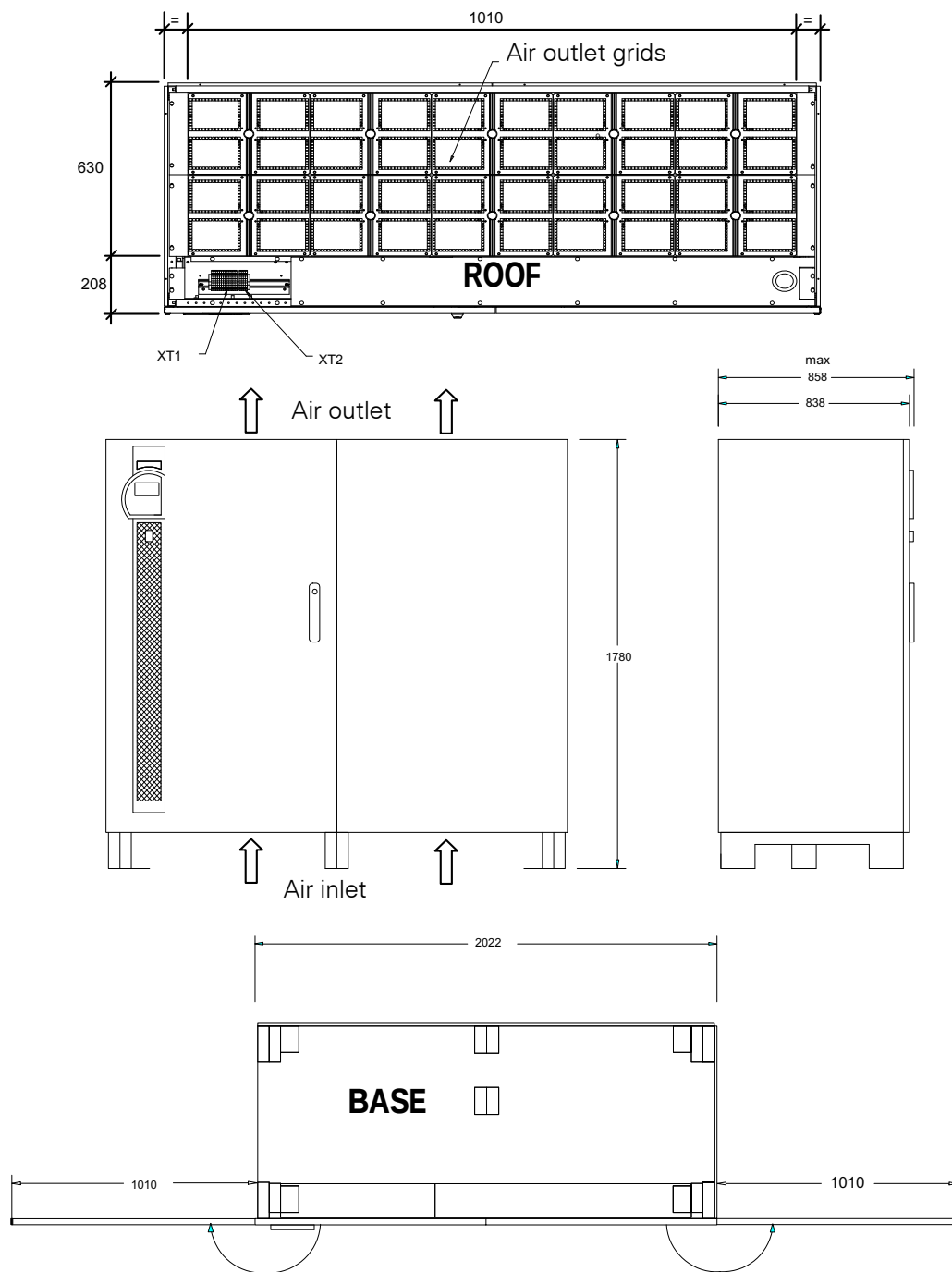
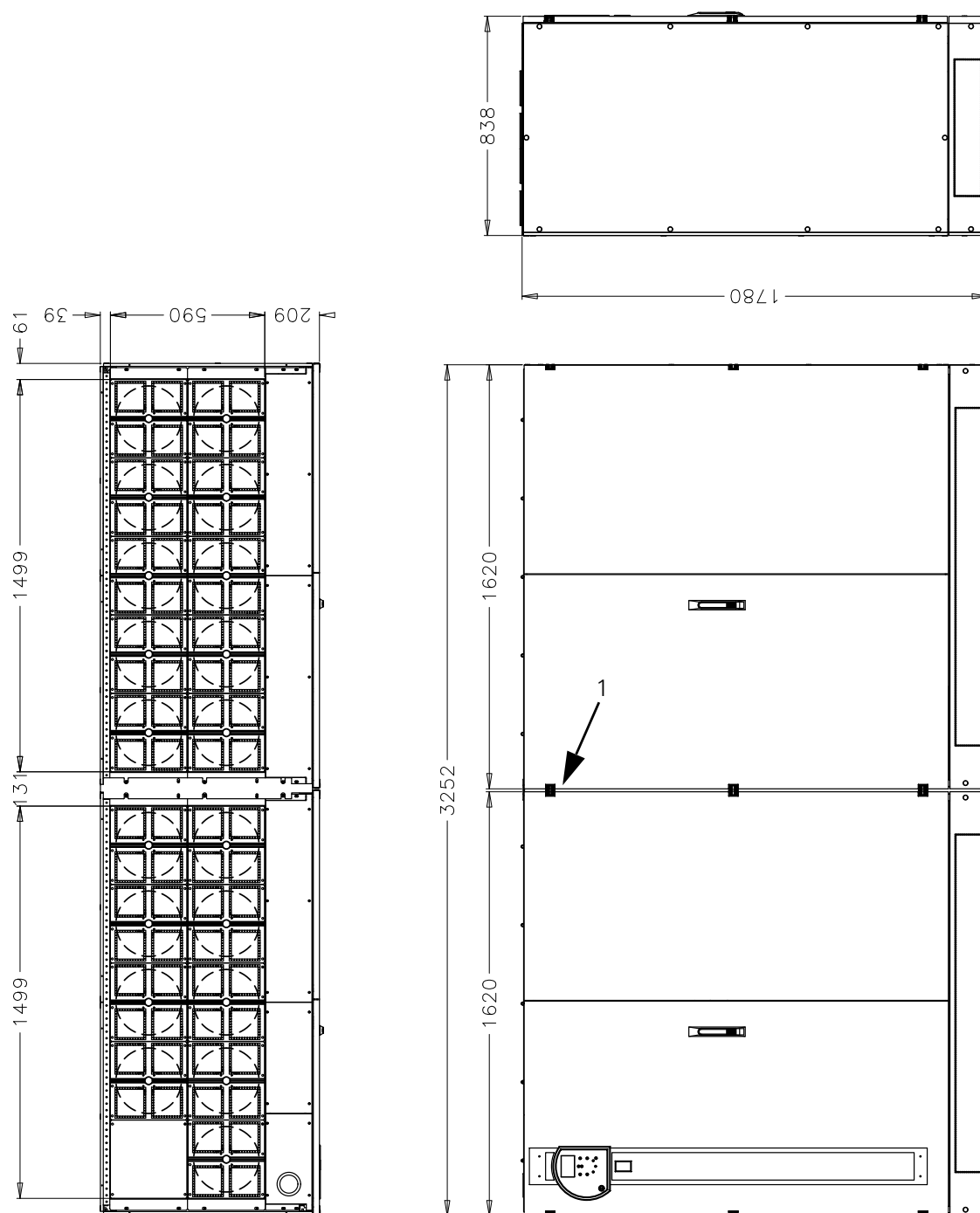


Figure 10 - Dimensions of UPS ratings 600/800kVA

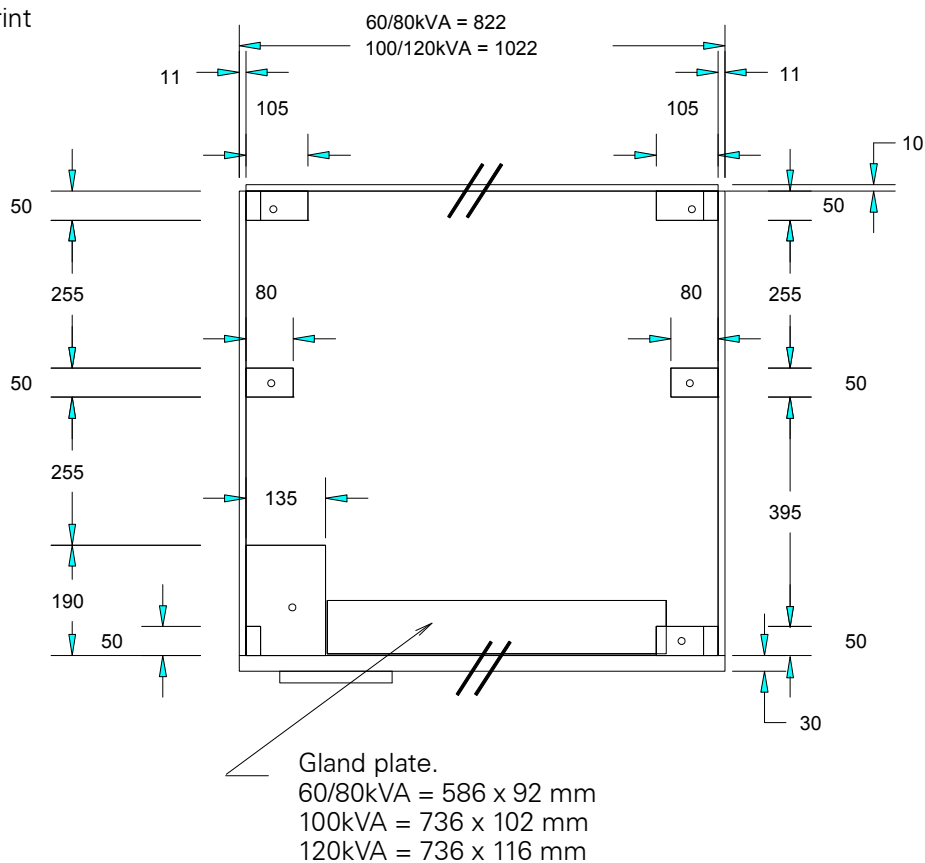


1 - The busbars for interconnection with the output cubicle protrude beyond the width of the input cubicle (which is supplied without a right side panel); the overall width of the UPS is equal to the width of the two cubicles, installed side by side, plus 30 mm interconnection space = 3,25m.

2 - The external front panels (I/P cubicle left, and O/P cubicle right) can be opened through 180°, whereas the internal front panels (I/P cubicle right, and O/P cubicle left) can only be opened through 135°.

Figure 11 - Cubicle footprint - 60 - 120kVA

1) Footprint



2) Floor mounting holes
(diameter = 12mm)

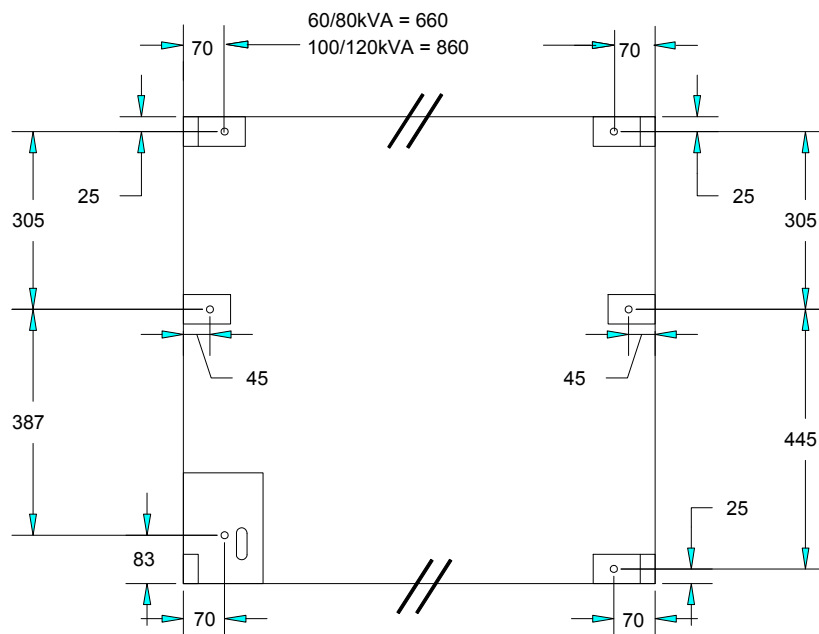


Figure 12 - Cubicle footprint - 160 - 200kVA

1) Footprint

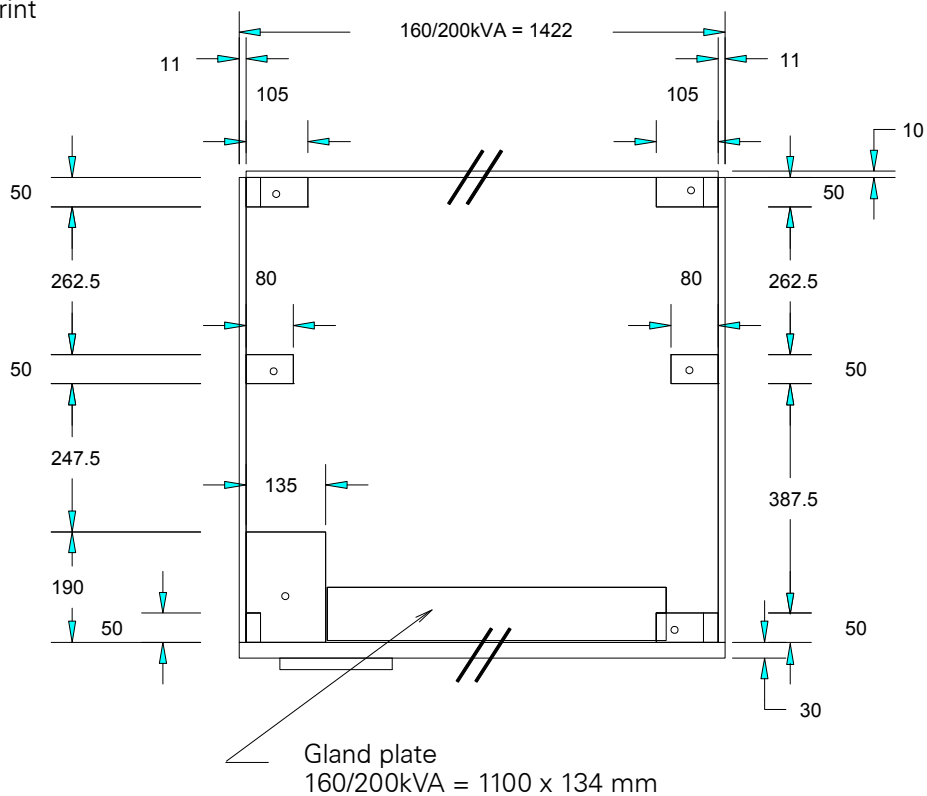
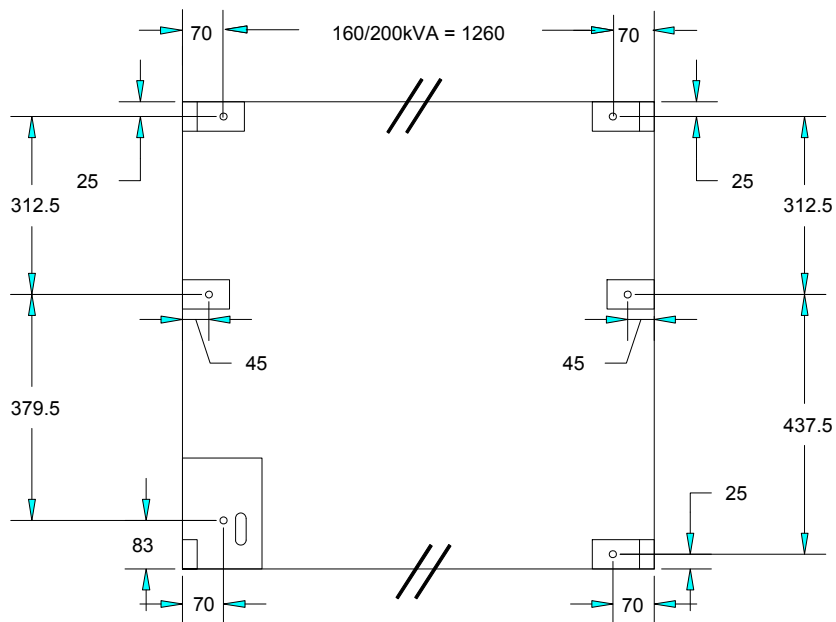
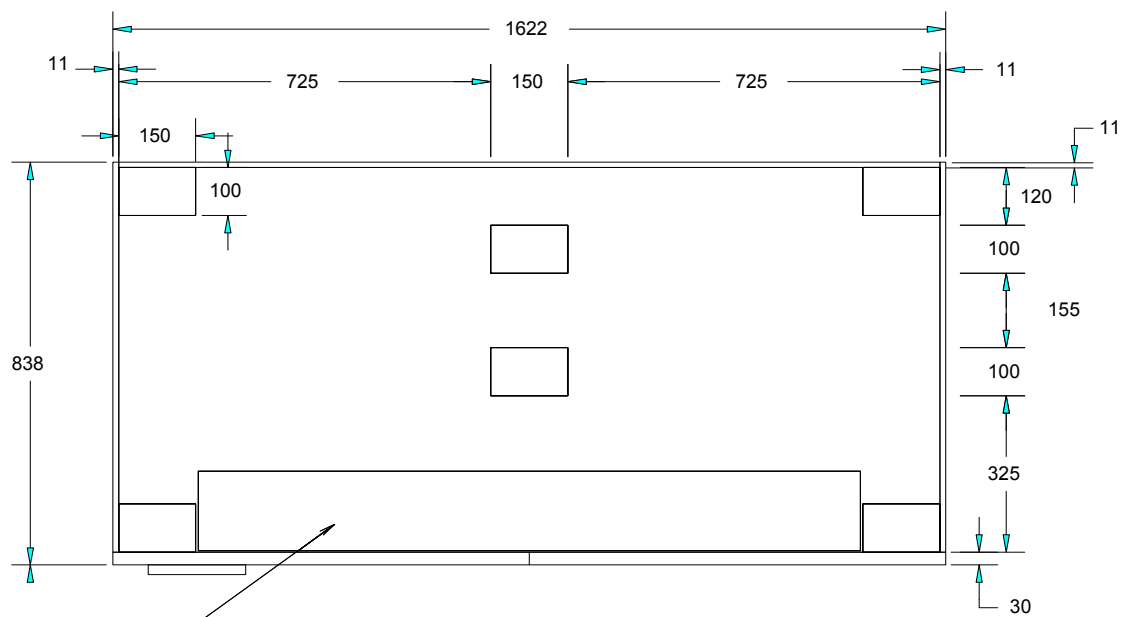
2) Floor mounting holes
(diameter = 12mm)

Figure 13 - Cubicle footprint - 250/300/400kVA

1) Footprint



Gland plate
250/300/400KVA = 1290 x 156 mm

2) Floor mounting holes
(diameter = 12mm)

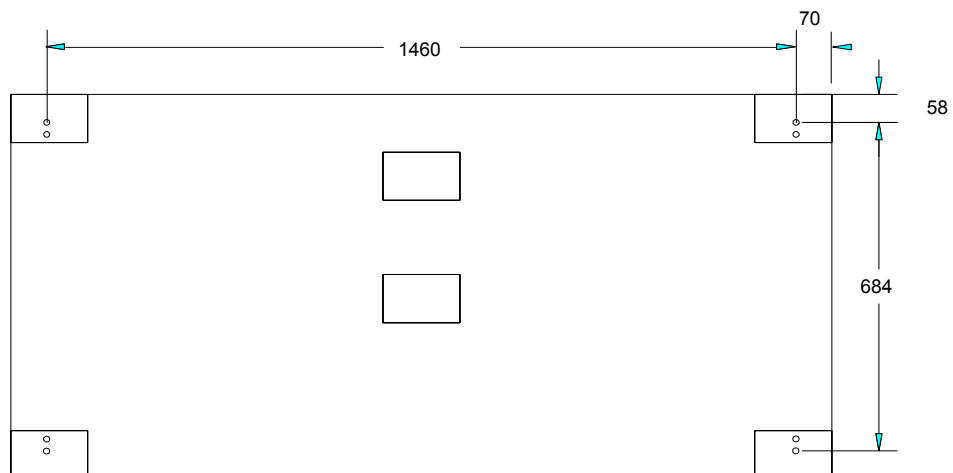


Figure 14 - Cubicle footprint 500kVA

1) Footprint

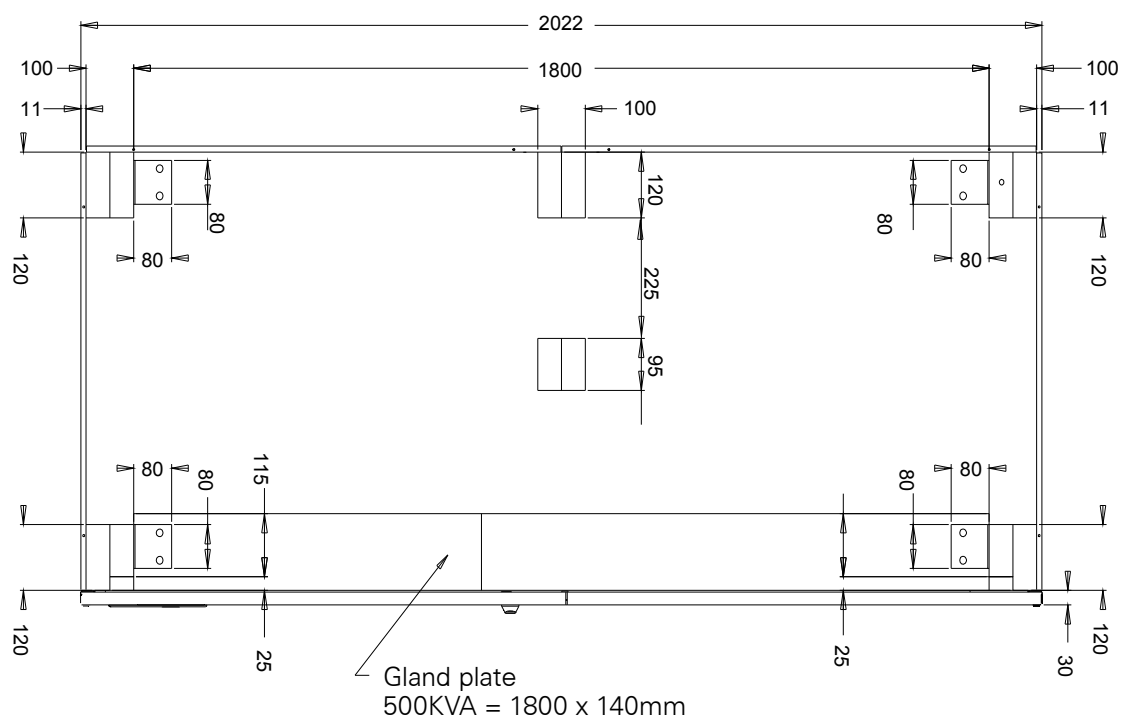
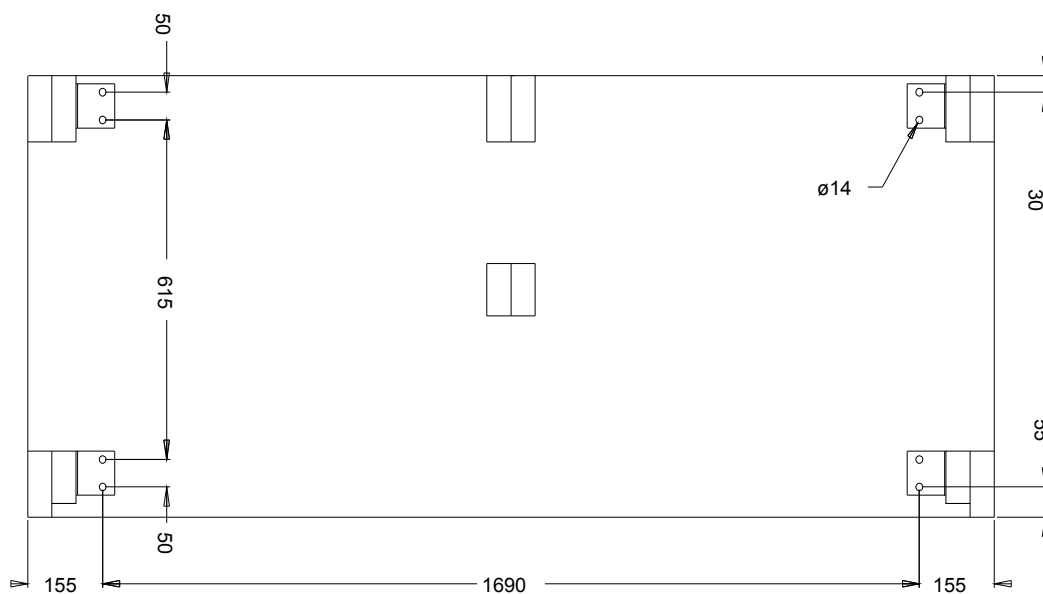
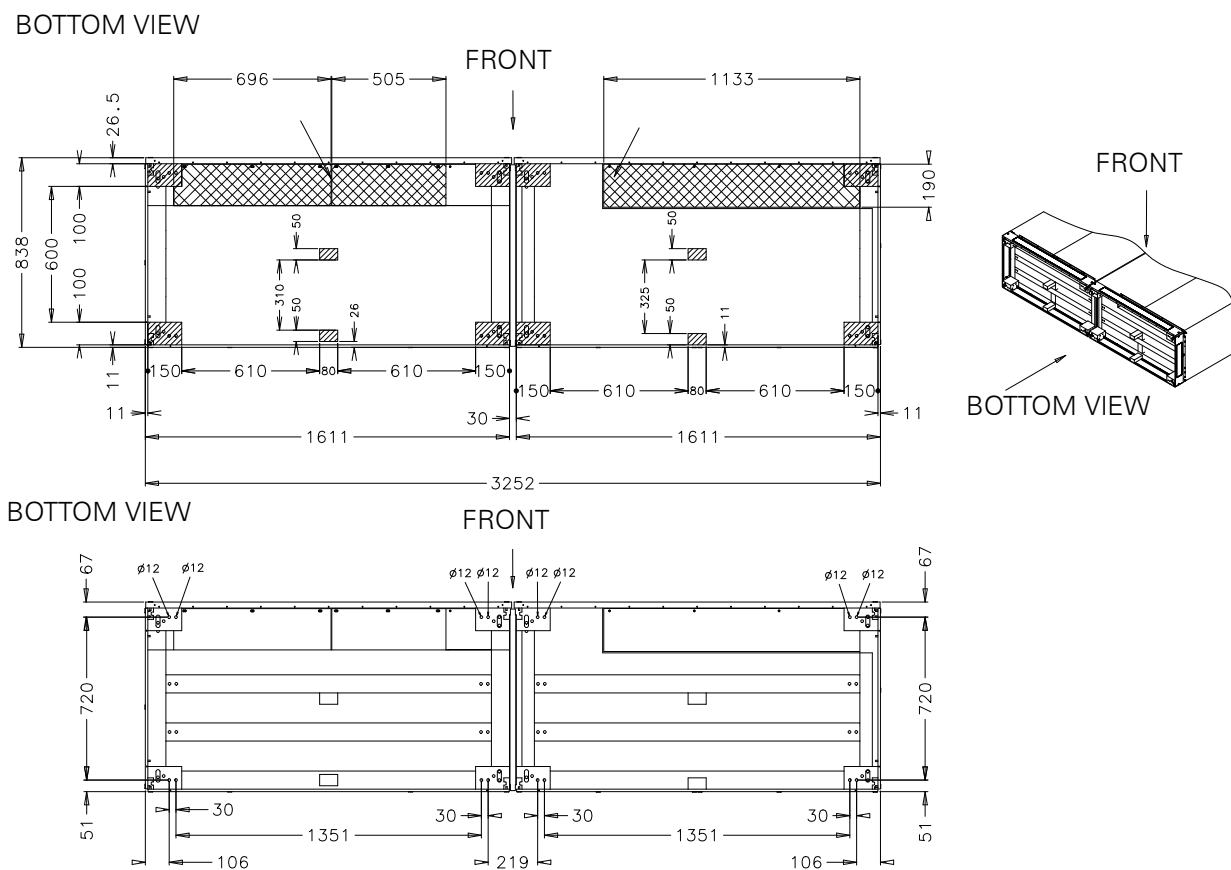
2) Floor mounting holes
(diameter = 14mm)

Figure 15 - Cubicle footprint - 600/800kVA



6. POWER AND SIGNAL CONNECTIONS

6.1. Power connections



Danger

For reasons of safety the Operator MUST NOT REMOVE the secondary access panel. If, for any reason, it is necessary to remove this panel, the installation must be switched off and de-energised, otherwise complete safety cannot be guaranteed.

The UPS is connected to 400/230 V three-phase mains; DC voltages above 500 V are additionally present in the battery circuit. Installation must only be carried out by qualified personnel in accordance with these operating instructions and the regulations of the local electricity provider. The UPS devices create a large leakage current; therefore connect to ground prior to commissioning. Improper connection can damage the device and lead to injuries and even death.



Danger

Mains overvoltage: this UPS must be protected against overvoltages deriving from the feeding mains. The device was developed in accordance with the product normative EN 50091-2, which relates to the IEC 1000-4-5. Overvoltages must be planned for in the power supply system, including those caused by lightning strikes as well as those produced internally as the result of switching inductive or capacitive loads, such as power transformers or capacitor banks or as the result of short-circuit shut-downs.



Notice

This device is not equipped with its own mains separation device. You are, therefore, required to provide a mains separation device at the installation site. It must be installed near the device and labelled as the mains separation device for the UPS. These mains separation devices and all upstream switches must be provided with a warning plate on which the following is stated: "ISOLATE THE UNINTERRUPTIBLE POWER SYSTEM (UPS) PRIOR TO OPERATING ON THIS CIRCUIT".



Notice

QS2 and QS4 are used for disconnecting.

The following table gives indications of cable cross sections and fuse ratings. For mains and load connection **use exclusively the screws provided** to ensure that the specified air and leakage distances are maintained. The feeds for the rectifier or bypass and service bypass can be supplied from either separate (optional, see Fig. 14) or the same mains supply. The load is connected to the load connection.

Cable dimensions are purely indicative. They are applicable only in the following cases:

- copper wire with PVC insulation (max. operating temperature = 70° C, multi-core - to 35 mm², single-core - greater than 35 mm²),
- cables are fitted in separate conduits for each line (input, output, battery),
- air temperature in conduits does not exceed 30° C,
- the maximum number of cables per conduit is 4.
- when laying in channels or for electric installation conduits
- for cable lengths up to 30 m

If conditions are different refer to DIN VDE 0298 part 4. When selecting the conductor cross section, local conditions and standards, as well as application-specific voltage drops due to cable lengths, must be taken into account. If the UPS is to supply predominantly non-linear loads, multiply the quoted cross section for PEN by 1.6.

Recommended earth wire sizes are purely indicative; they may be calculated exactly using the following formula:

$$s = \sqrt{\frac{I^2 \cdot t}{k}}$$

where:

- s = min. earth wire size (mm)
- I².t = nominal I².t of the protection device (on the Mains input)
- k = coefficient depending on insulating material (for PVC, max. operating temperature = 70° C, k = 143)

In different conditions, wire size can be calculated in accordance with IEC standard 287.

If the length of the cables causes a voltage drop > 3%, use a larger wire size.

Data provided in the table concerning selectivity of the load fuses apply for activated electronic bypass.



In order to guarantee safe working conditions, ensure all voltage sources are isolated before carrying out the power connections. The UPS battery switch is equipped with an electro-mechanical interlock, however, we recommend that YOU CHECK THAT THE POLARITY IS CORRECT!!

Table 3: Cable dimensions and fuse ratings

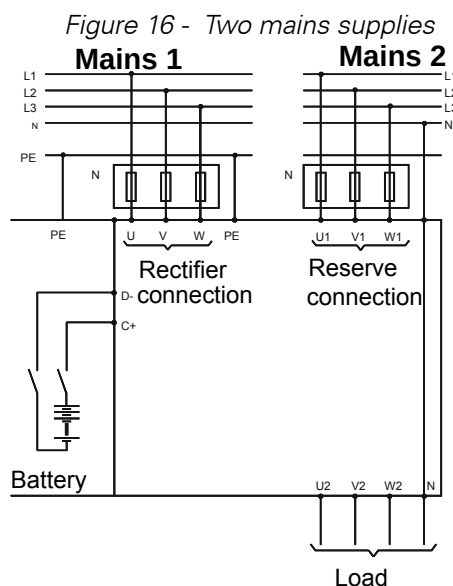
Description	UM	Rating (kVA)					
		60	80	100	120	160	200
See on page		Fig. 17 36		Fig. 18 37		Fig. 20 39	
Max. I_{mains} I/P @ 400V ⁽¹⁾	A	120	160	200	240	317	397
Recommended wire size ^{(2) (3)}	mm ²	50 (2x16)	70 (2x25)	95	120	2x70	2x95
Wire socket screw size	mm	M8x25			M10x30		
Nom. $I_{\text{out/res}}$ @ 400V ^{(1) (5)}	A	87	116	145	174	232	290
Recommended wire size ⁽⁴⁾	mm ²	35 (2x10)	50 (2x16)	70 (2x25)	95 (2x35)	2x50	2x70
Wire socket screw size	mm	M8x25			M10x30		
I_{batt} I/P (discharging @1.8V/cell)	A	145	193	240	289	382	478
Recommended wire size	mm ²	70 (2x25)	95 (2x35)	120 (2x50)	2x70 (3x35)	3x50 (4x35)	2x120 (3x70)
Wire socket screw size	mm	M8x25			M10x30		
Recommended wire size for earth conductor	mm ²	35		50	70	95	120
Wire socket screw size	mm	M8x25			M10x30		

Description	UM	Rating (kVA)					
		250	300	400	500	600	800
See on page		Fig. 21		Fig. 22	Fig. 23	Fig. 24 and Fig. 25	
		40		41	42	43 and 44	
Max. I_{mains} I/P @ 400V ⁽¹⁾	A	495	592	790	980	1154	1600
Recommended wire size ^{(2) (3)}	mm ²	2x120	2x180 (3x120)	4x120 (2x240)	5x120 (3x240)	3x240	4x240
Wire socket screw size	mm	M12x40					
Nom. $I_{\text{out/res}}$ @ 400V ^{(1) (5)}	A	360	435	580	725	870	1160
Recommended wire size ⁽⁴⁾	mm ²	2x95	2x120 (3x70)	2x180 (3x120)	4x120 (2x240)		3x240
Wire socket screw size	mm	M12x40					
I_{batt} I/P (discharging @1.8V/cell)	A	493	591	788	985	1170	1570
Recommended wire size	mm ²	2x120 (2x180)	3x120 (2x180)	4x120 (2x240)	5x120 (3x240)	3x240	4x240
Wire socket screw size	mm	M12x40					
Recommended wire size for earth conductor	mm ²	120	2x95	2x120 (240)	3x120 (2x240)		4x120 (2x240)
Wire socket screw size	mm	M12x40					

Tightening torque	Screw size	Nm (+/-10%)
	M8	20
	M10	39
	M12	68

- (1) For nominal voltage of 380V, multiply current value by 1.05; for 415V, multiply by 0.95.
 (2) With cable lug according to DIN46235.
 (3) When using the cable dimensions indicated in brackets a support rail shall be installed by the customer. The support rail supplied with the UPS must be removed.
 (4) For non-linear loads, the neutral cable dimension must be 1.6 times the recommended dimension.
 (5) The Reserve Input must be supplied by a three-phase plus neutral system.

6.2. Cable lengths



For calculating the cable lengths, note the cable guide appropriate for your installation, either from behind, from above or through an installation-side double bottom.



Carry out the mains connection as follows:

- Open the front door of the UPS.
- Remove the protective screen in front of the connection terminals.
- Check whether your UPS is fitted for one or two mains supplies and prepare the connection according to the wiring diagram Fig. 14. The connections C+ and D- are located in the input connection terminal field.



Notice

For modular, parallel systems in which an additional output switch is installed for each UPS, the state of each individual switch, connected in series with the UPS output switch (QS4), must be monitored in order to prevent the entire load from being switched to a single UPS.

After being setup in its final location, make the following connections to the UPS:



- **Make the ground connections (PE).**
- **Establish the mains and load connections.**
- **Remount the cable-entry cover and terminal fields.**
- **Provide physical support for the ground, mains and load connections.**

If UPS is supplied from one mains only:

- Connect the mains supply cables to the UPS terminals U1, V1, W1, N. The following jumpers must be fixed between the terminals: U1-U2, V1-V2, W1-W2 and N1-N2.

If UPS is supplied from two mains:

- Connect the mains 1 supply cables to the UPS terminals U1, V1, W1, N1.
- Connect the mains 2 supply cables to the UPS terminals U2, V2, W2, N2.

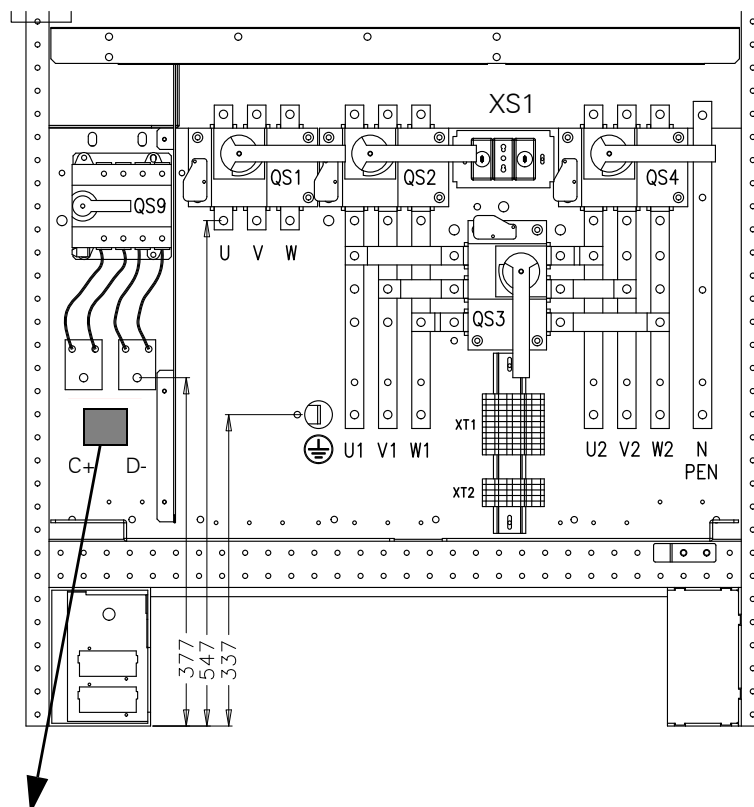
6.3. Backfeed Protection

This feature prevents any potential risk of electric shock at the UPS bypass input AC terminals in the event of a Bypass static switch SCR failure. The control circuit includes a contact, that the customer can use to activate an external isolating device, such as an electromagnetic relay, which will disconnect the bypass mains supply to the UPS when a backfeed is detected. The backfeed protection contacts are available at pins 3, 4, and 5 of XT1 (see "Individual UPS signal connection information" on page 48.) Pin 3 is normally closed (NC) with respect to pin 5 (Common), while pin 4 is normally open (NO). CHLORIDE recommends connecting the device signal connections between the Normally Closed and Common contacts.

In compliance with the Standard IEC/EN 62040-1, the external isolating device, which must be an air-gap isolator, in accordance with clause 5.1.4 of the aforementioned Standard, **IS NOT** supplied with the UPS.

6.4. 60-80kVA UPS power connections

Figure 17 - 60-80kVA UPS connections



WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTIR A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DIKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

KEY

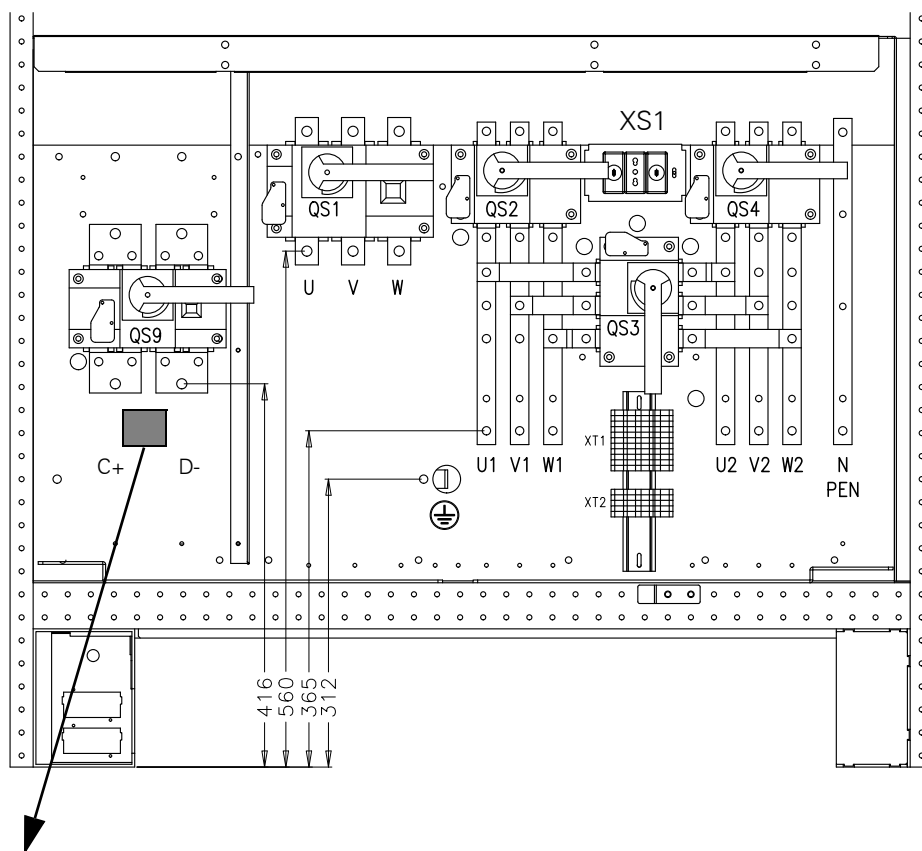
QS1 = MAINS INPUT switch (U, V, W)
 QS2 = RESERVE INPUT switch (U1, V1, W1)
 QS3 = BYPASS switch
 QS4 = UPS OUTPUT switch (U2, V2, W2)
 QS9 = BATTERY switch
 XS1 = EASY/LIFE power socket
 XT1 = REMOTE ALARMS terminal board
 XT2 = REMOTE ALARMS terminal board

CONNECTIONS

U, V, W = MAINS INPUT
 U1, V1, W1 = RESERVE INPUT
 U2, V2, W2 = UPS OUTPUT to LOAD
 N = RESERVE INPUT AND OUTPUT NEUTRAL
 CONNECTION
 C+, D- = BATTERY TERMINALS
 PE = EARTH connection

6.5. 100-120kVA UPS power connections

Figure 18 - 100kVA UPS connections



WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTIR A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DIKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

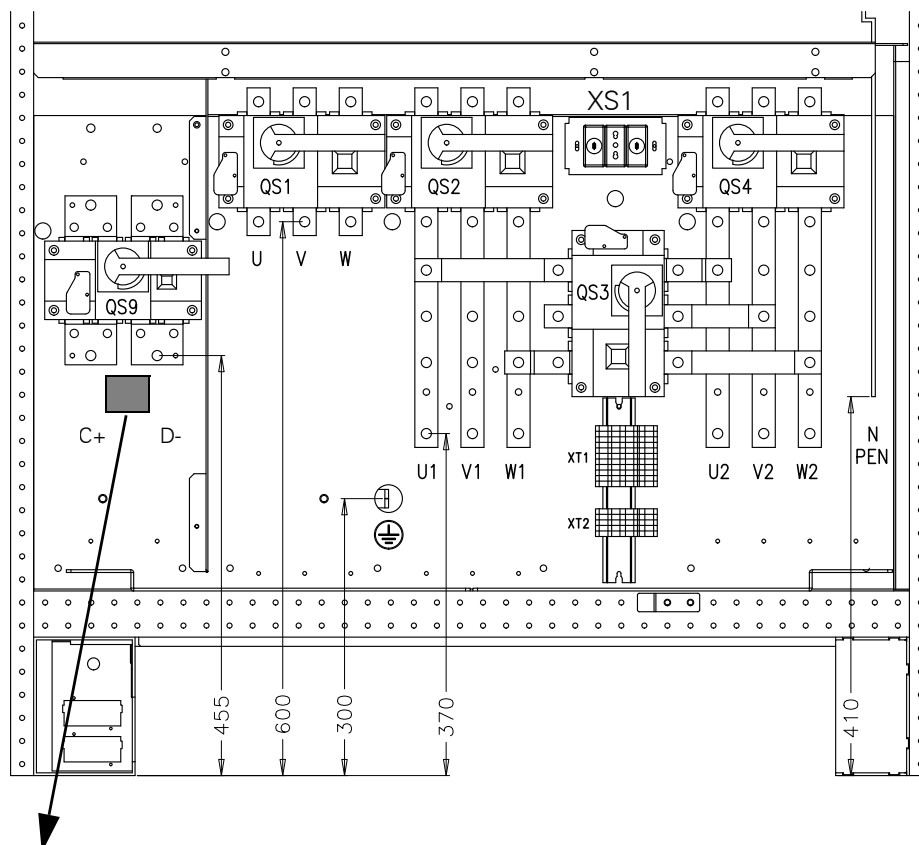
KEY

QS1 = MAINS INPUT switch (U, V, W)
 QS2 = RESERVE INPUT switch (U1, V1, W1)
 QS3 = BYPASS switch
 QS4 = UPS OUTPUT switch (U2, V2, W2)
 QS9 = BATTERY switch
 XS1 = Power socket
 XT1 = REMOTE ALARMS terminal board
 XT2 = REMOTE ALARMS terminal board

CONNECTIONS

U, V, W = MAINS INPUT
 U1, V1, W1 = RESERVE INPUT
 U2, V2, W2 = UPS OUTPUT to LOAD
 N = RESERVE INPUT AND OUTPUT NEUTRAL
 CONNECTION
 C+, D- = BATTERY TERMINALS
 PE = EARTH connection

Figure 19 - 120kVA UPS connections



WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTIR A POLARIDADE CORRETA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DİKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

KEY

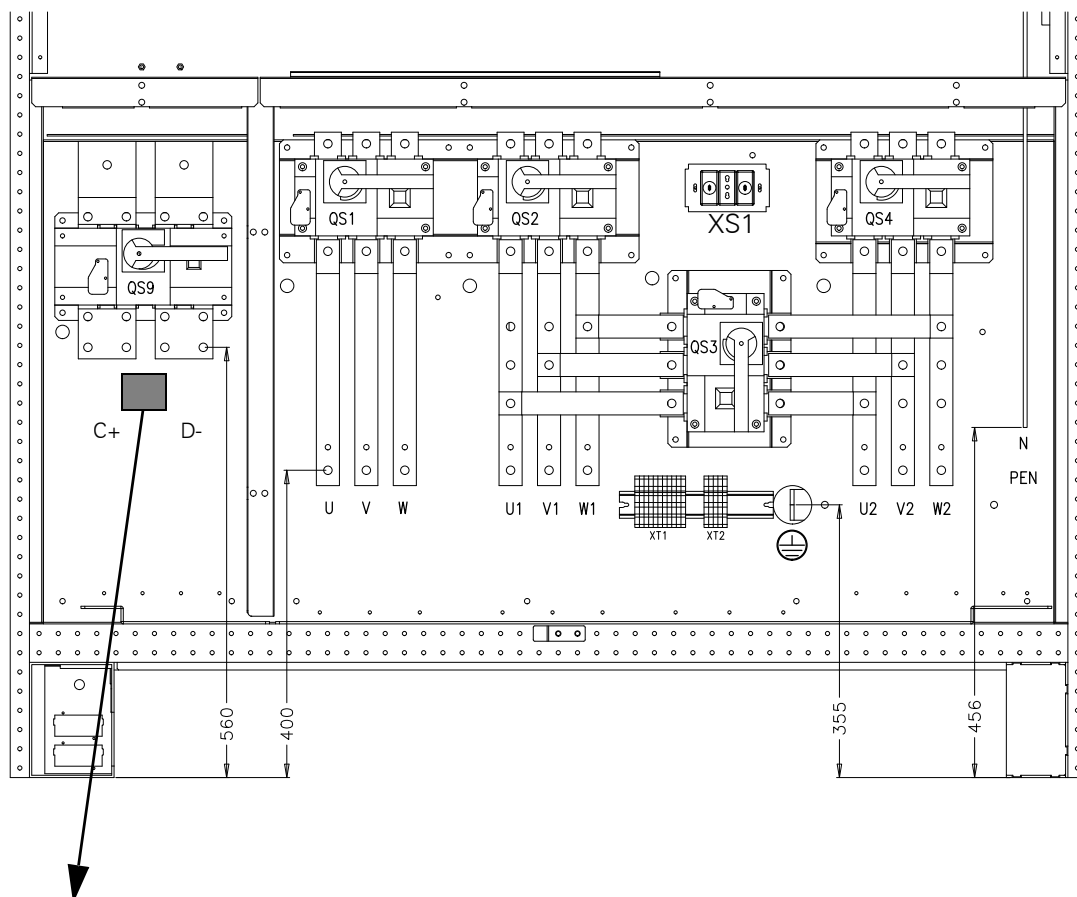
QS1 = MAINS INPUT switch (U, V, W)
 QS2 = RESERVE INPUT switch (U1, V1, W1)
 QS3 = BYPASS switch
 QS4 = UPS OUTPUT switch (U2, V2, W2)
 QS9 = BATTERY switch
 XS1 = Power socket
 XT1 = REMOTE ALARMS terminal board
 XT2 = REMOTE ALARMS terminal board

CONNECTIONS

U, V, W = MAINS INPUT
 U1, V1, W1 = RESERVE INPUT
 U2, V2, W2 = UPS OUTPUT to LOAD
 N = RESERVE INPUT AND OUTPUT NEUTRAL CONNECTION
 C+, D- = BATTERY TERMINALS
 PE = EARTH connection

6.6. 160-200kVA power connections

Figure 20 - 160-200kVA UPS connections



WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTIR A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DİKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

KEY

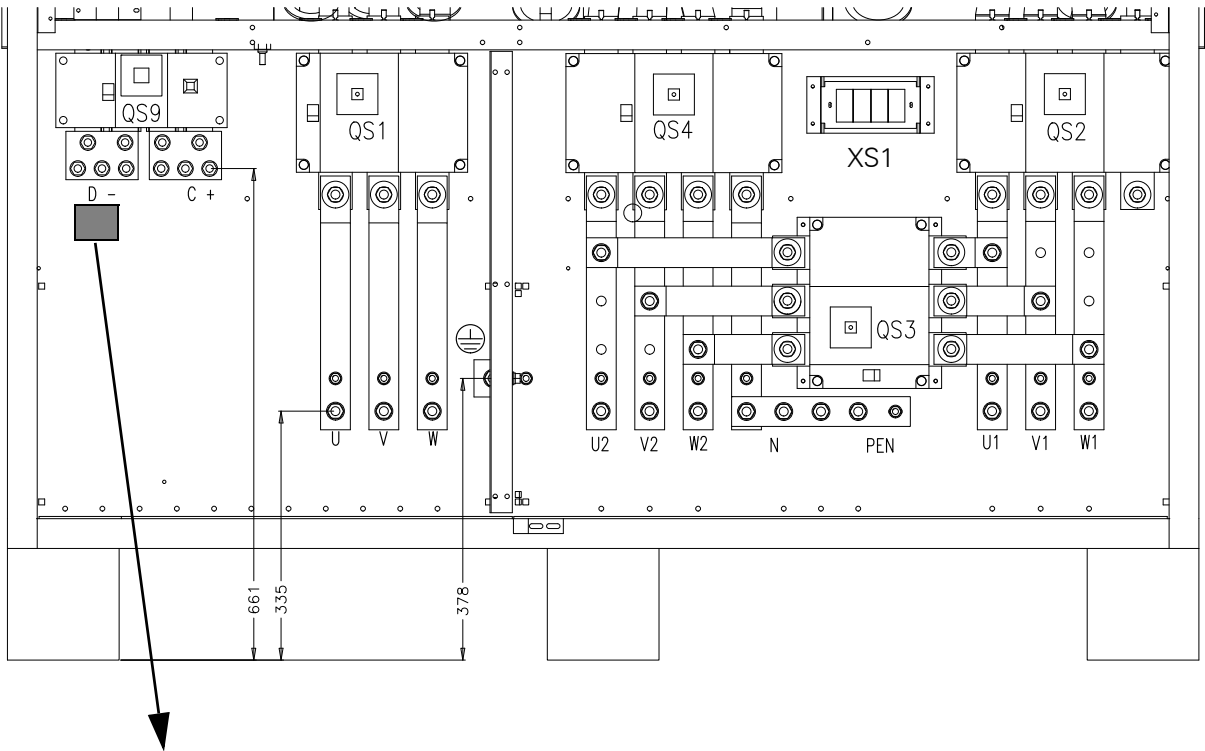
QS1 = MAINS INPUT switch (U, V, W)
 QS2 = RESERVE INPUT switch (U1, V1, W1)
 QS3 = BYPASS switch
 QS4 = UPS OUTPUT switch (U2, V2, W2)
 QS9 = BATTERY switch
 XS1 = Power socket
 XT1 = REMOTE ALARMS terminal board
 XT2 = REMOTE ALARMS terminal board

CONNECTIONS

U, V, W = MAINS INPUT
 U1, V1, W1 = RESERVE INPUT
 U2, V2, W2 = UPS OUTPUT to LOAD
 N = RESERVE INPUT AND OUTPUT NEUTRAL CONNECTION
 C+, D- = BATTERY TERMINALS
 PE = EARTH connection

6.7. 250/300kVA UPS power connections

Figure 21 - 250/300UPS connections

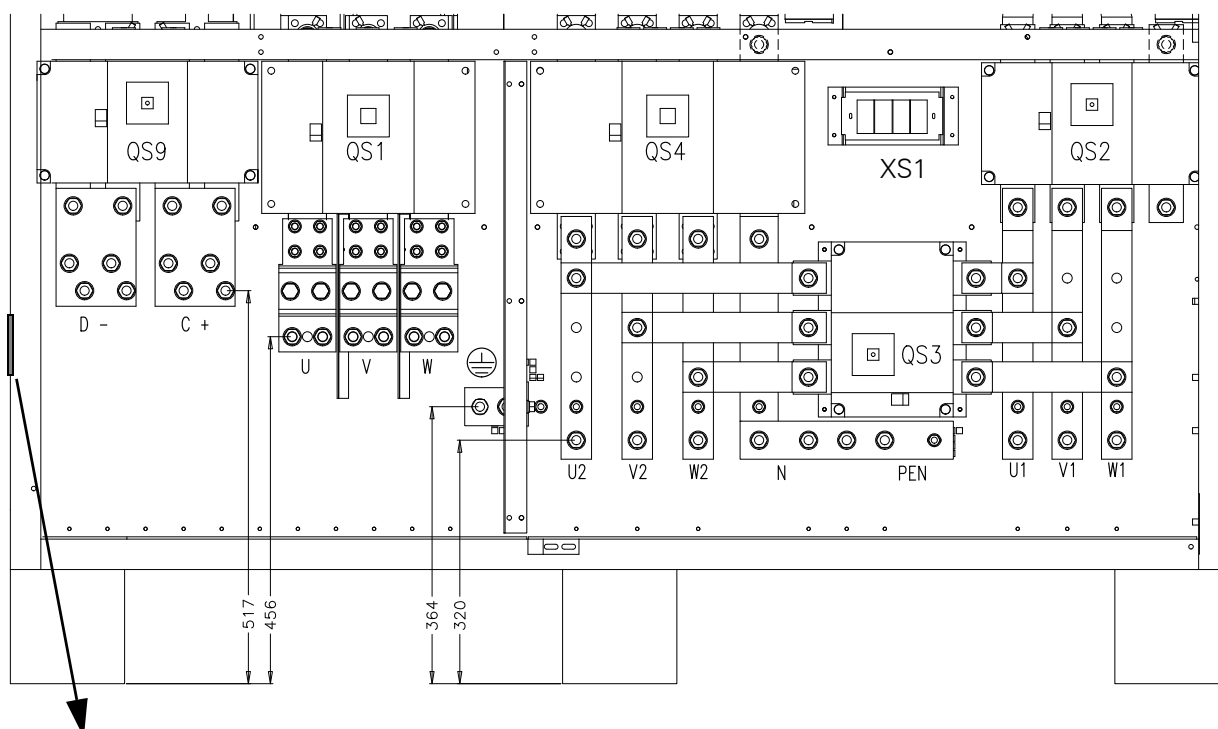


WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTA A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DİKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

- KEY
- QS1 = MAINS INPUT switch (U, V, W)
 - QS2 = RESERVE INPUT switch (U1, V1, W1)
 - QS3 = BYPASS switch
 - QS4 = UPS OUTPUT switch (U2, V2, W2)
 - QS9 = BATTERY switch
 - XS1 = EASY/LIFE power socket
- CONNECTIONS
- U, V, W = MAINS INPUT
 - U1, V1, W1 = RESERVE INPUT
 - U2, V2, W2 = UPS OUTPUT to LOAD
 - N = RESERVE INPUT AND OUTPUT NEUTRAL CONNECTION
 - C+, D- = BATTERY TERMINALS
 - PE = EARTH connection

6.8. 400kVA UPS power connections

Figure 22 - 400kVA UPS connections



This label is applied on the inside left panel

WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTA A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DİKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

KEY

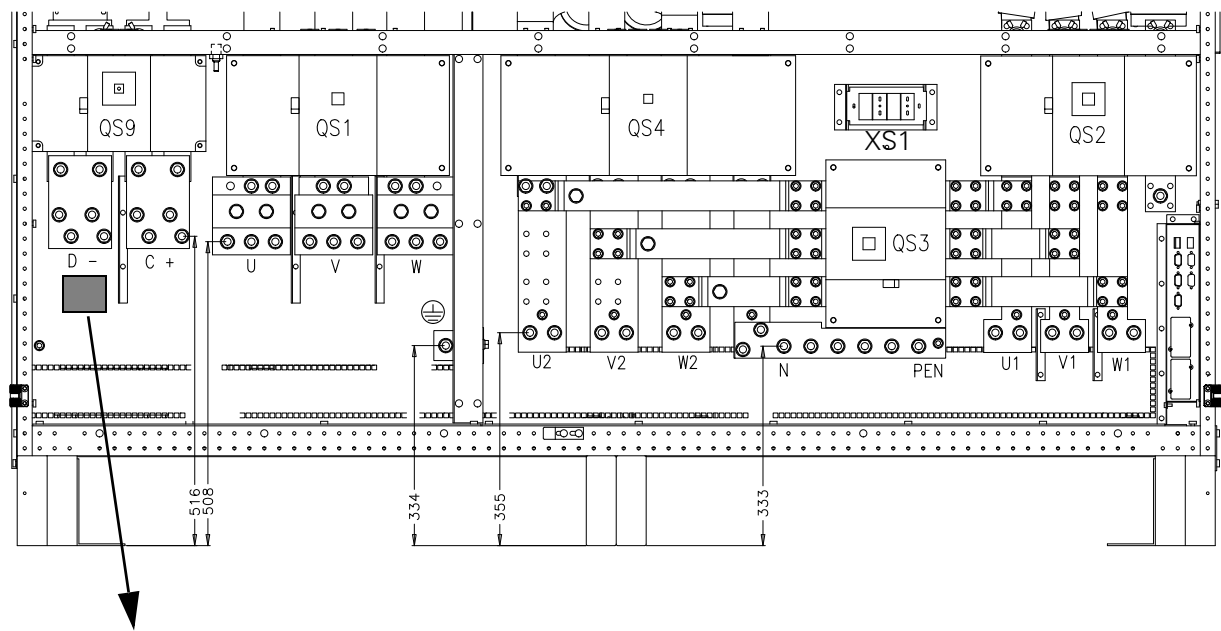
QS1 = MAINS INPUT switch (U, V, W)
 QS2 = RESERVE INPUT switch (U1, V1, W1)
 QS3 = BYPASS switch
 QS4 = UPS OUTPUT switch (U2, V2, W2)
 QS9 = BATTERY switch
 XS1 = EASY/LIFE power socket

CONNECTIONS

U, V, W = MAINS INPUT
 U1, V1, W1 = RESERVE INPUT
 U2, V2, W2 = UPS OUTPUT to LOAD
 N = RESERVE INPUT AND OUTPUT NEUTRAL
 CONNECTION
 C+, D- = BATTERY TERMINALS
 PE = EARTH connection

6.9. 500kVA UPS power and signal connections

Figure 23 - 500kVA UPS power connections



WARNING ENSURE CORRECT POLARITY!
ATTENZIONE VERIFICARE LA POLARITA' CORRETTA!
ATTENTION VEILLER AU RESPECT DE LA POLARITÉ!
ACHTUNG KORREKTE POLUNG SICHERSTELLEN!
ATENCIÓN COMPROBAR QUE LA POLARIDAD ES CORRECTA!
ATENÇÃO GARANTA A POLARIDADE CORRECTA!
ВНИМАНИЕ ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!
DIKKAT KUTUPSALLIĞI GARANTİ EDİNİZ!
UWAGA SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

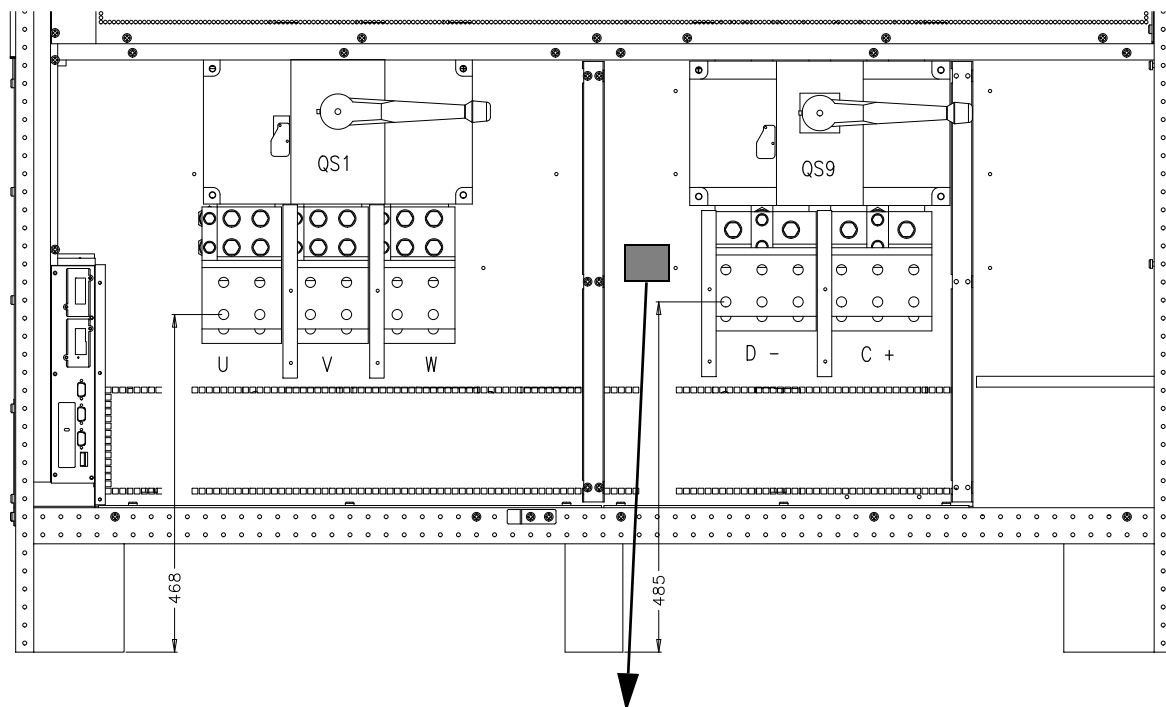
- KEY

 - QS1 = MAINS INPUT switch (U, V, W)
 - QS2 = RESERVE INPUT switch (U1, V1, W1)
 - QS3 = BYPASS switch
 - QS4 = UPS OUTPUT switch (U2, V2, W2)
 - QS9 = BATTERY switch
 - XS1 = Power socket
- CONNECTIONS

 - U, V, W = MAINS INPUT
 - U1, V1, W1 = RESERVE INPUT
 - U2, V2, W2 = UPS OUTPUT to LOAD
 - N = RESERVE INPUT AND OUTPUT NEUTRAL CONNECTION
 - C+, D- = BATTERY TERMINALS
 - PE = EARTH connection

6.10. 600/800kVA power and signal connections

Figure 24 - 600/800kVA power connections - Input cubicle



KEY

QS1 = MAINS INPUT switch (U, V, W)

QS9 = BATTERY switch

CONNECTIONS

U, V, W = MAINS INPUT

C+, D- = BATTERY TERMINALS

WARNING

ENSURE CORRECT POLARITY!

ATTENZIONE

VERIFICARE LA POLARITA' CORRETTA!

ATTENTION

VEILLER AU RESPECT DE LA POLARITÉ!

ACHTUNG

KORREKTE POLUNG SICHERSTELLEN!

ATENCIÓN

COMPROBAR QUE LA POLARIDAD ES CORRECTA!

ATENÇÃO

GARANTA A POLARIDADE CORRECTA!

ВНИМАНИЕ

ОБЕСПЕЧИТЬ ПРАВИЛЬНУЮ ПОЛЯРНОСТЬ!

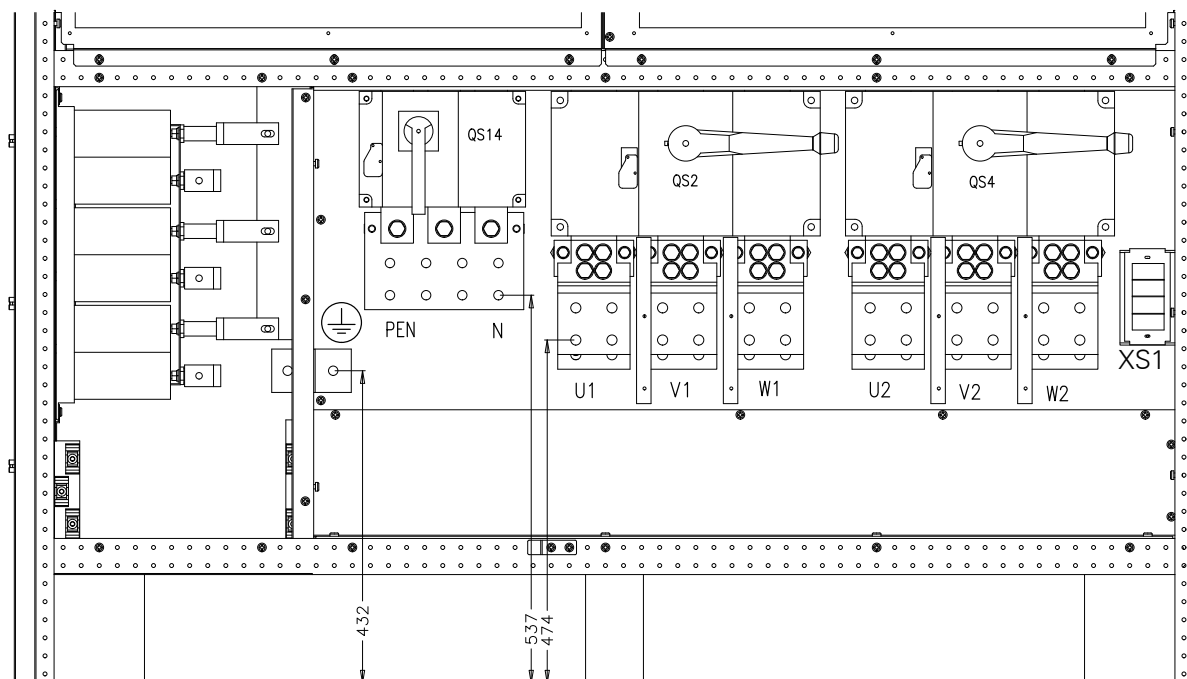
DİKKAT

KUTUPSALLIĞI GARANTİ EDİNİZ!

UWAGA

SPRAWDZIĆ WŁAŚCIWĄ BIEGUNOWOŚĆ!

Figure 25 - 600/800kVA power connections - Output cubicle

**KEY**

QS2 = RESERVE INPUT switch (U1, V1, W1)

QS4 = UPS OUTPUT switch (U2, V2, W2)

QS14 = NEUTRAL switch (N)*

XS1 = Power socket

CONNECTIONS

U1, V1, W1 = RESERVE INPUT

U2, V2, W2 = UPS OUTPUT to LOAD

N = RESERVE INPUT AND OUTPUT - NEUTRAL CONNECTION

PE = EARTH connection

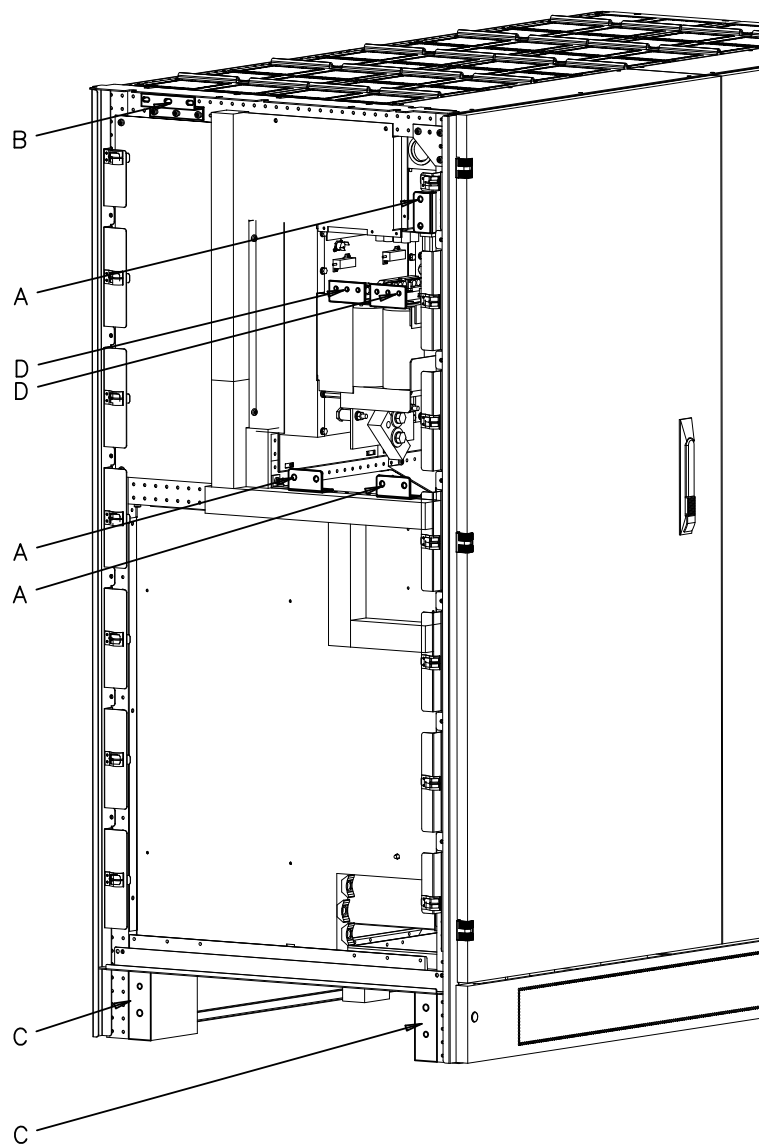
*** QS14 IS FOR MAINTENANCE USE ONLY, UNAUTHORISED OPERATION CAN RESULT IN LOSS OF LOAD SUPPLY.**

The 600 and 800kVA ratings are supplied without the manual bypass switch (corresponding to QS3 on other ratings). It is recommended that the Customer provide an external Bypass switch, ensuring that it is correctly rated (see Table 3 on page 34 for more information). Auxiliary signal contacts are provided at XT1, pins 11 and 12 (see Fig. 6.12), so that the status of the switch can be monitored during normal operation and the guided procedures.

6.10.1 600/800kVA input and output cubicle interconnections.

- Place the input and output cabinets side by side (input cabinet on the left).
- Using M8 x 30 hexagonal bolts, secure the three points indicated by the letter "A" (on the output cubicle - see Fig. 26) to the corresponding points on the input cubicle.
- Using M6 x 16 hexagonal bolts, secure the point indicated by the letter "B" (on the output cubicle - see Fig. 26) to the corresponding point on the input cubicle.
- Using M8 x 50 hexagonal bolts, connect the input and output feet together, see points indicated by the letter "C" (see Fig. 26)
- Using M8 x 25 hexagonal bolts, connect the Inverter + and - busbars, indicated by the letter "D" (on the output cubicle - see Fig. 26) to the corresponding rectifier module busbars on the input cabinet (see also Fig. 26)

Figure 26 - Output cubicle connection points



6.10.2. Connecting the braided Copper power cables

Remove the input cubicle right safety panel.

Remove the output cubicle left and right safety panels.

Remove the grid at the bottom of the switch area.

Connected the braided power cables from the input cubicle to the transformer TM2 terminals, indicated by the letter "G" (see Fig. 27), securing them at cable clamps "E," and routing them along the path marked "F."

Figure 27 - Plaited power cables

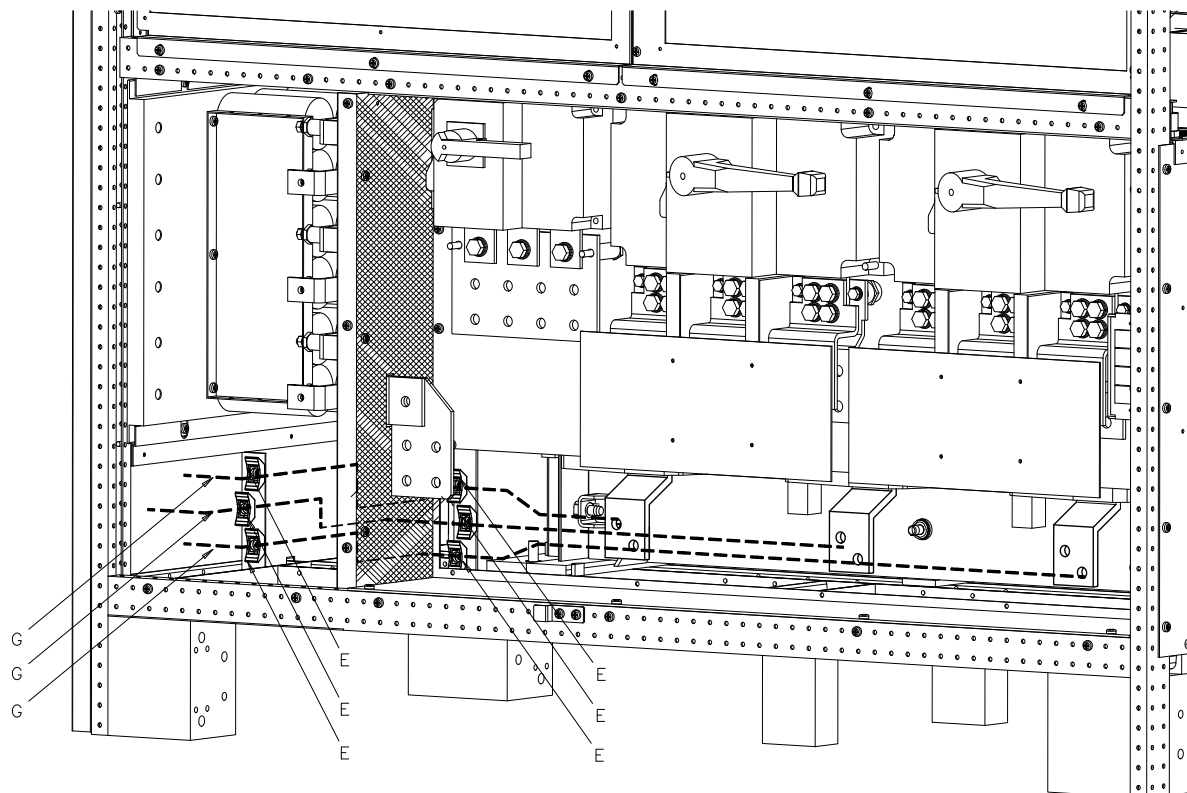
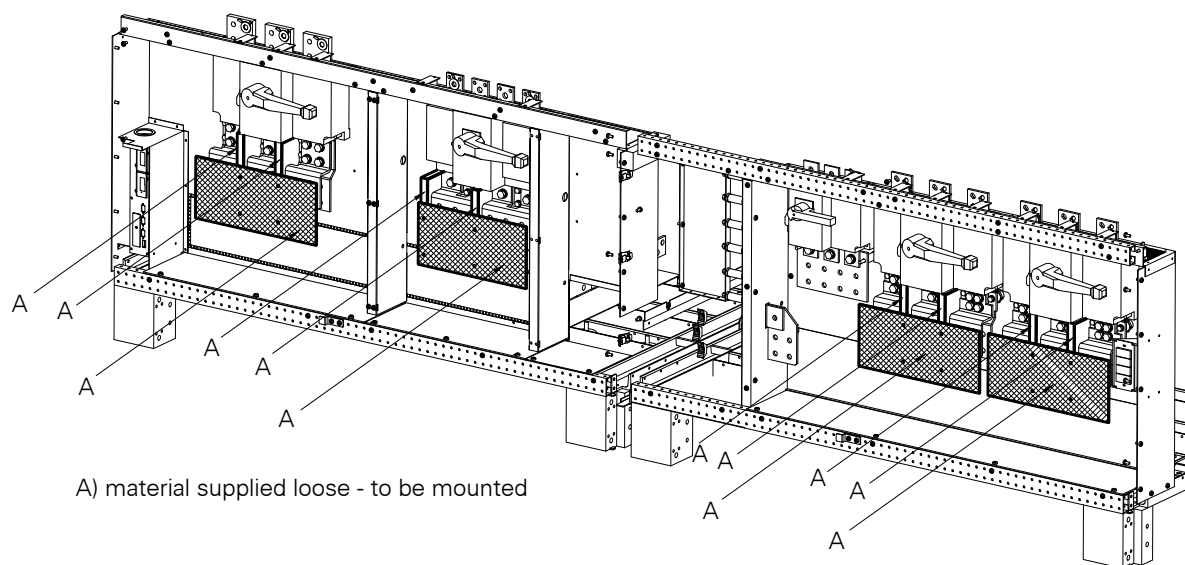


Figure 28 - Installing the lexan power connection protective panels



6.11. Signal connections

All signal cables (ribbon cables, shielded cables etc.) are already connected in the input cabinet. Once the input and output cabinets have been connected together, the signal cables must be connected to their corresponding points in the output cubicle:

(1) Connect the flat cables to:

- Inverter Static Switch Firing board AP43 - 2K
- Inverter Static Switch Firing board AP43 - 3K
- Reserve Static Switch Firing board AP44 - 2K
- Driver D board AP45 - 1K
- Driver D board AP45 - 2K
- Driver D board AP46 - 1K
- Driver D board AP46 - 2K
- Driver D board AP47 - 1K
- Driver D board AP47 - 2K

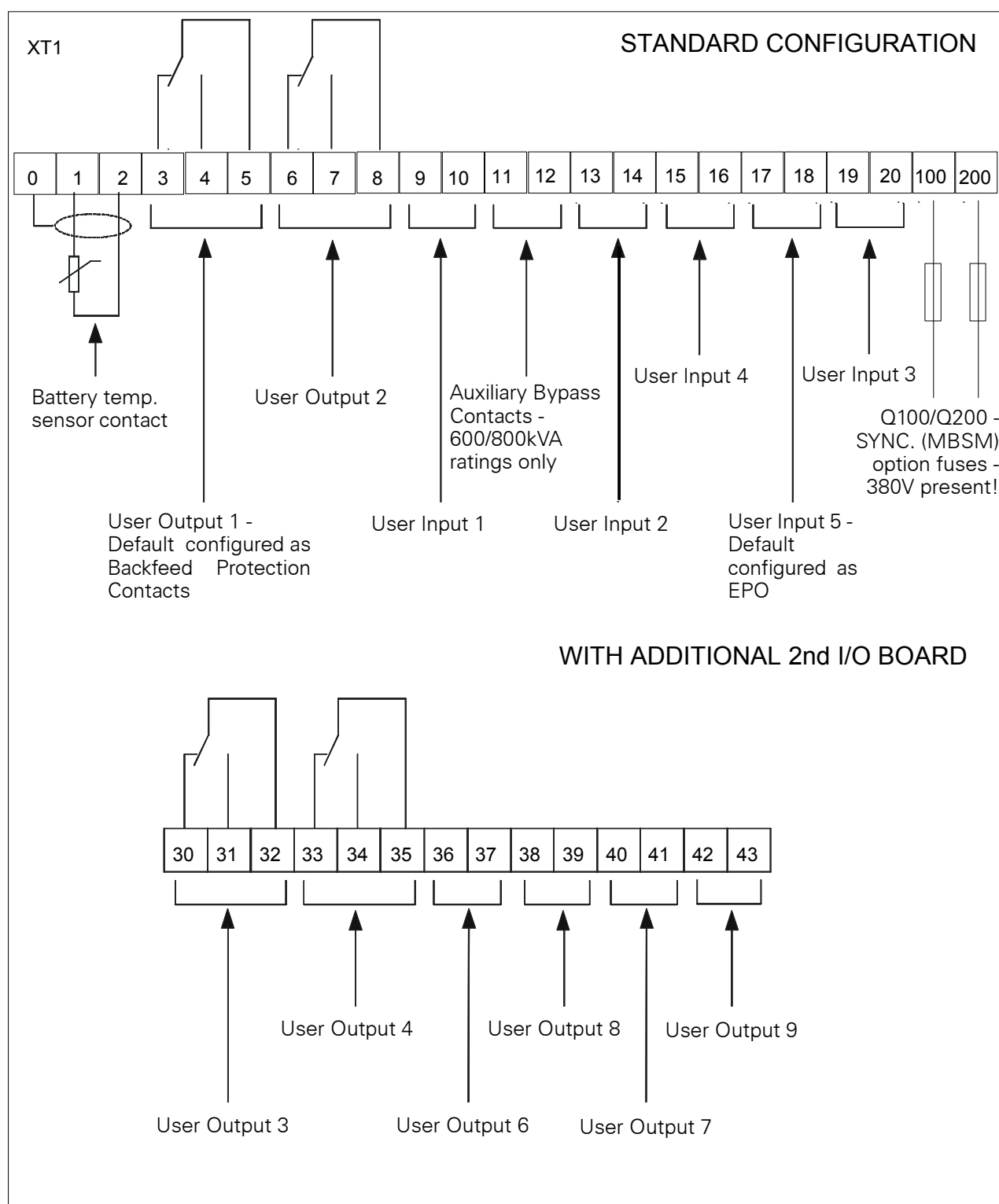
(2) Connect the two cables from the output cubicle to AP50 X101 and X102 in the input cubicle.

(3) Connect the X20 connectors together.

(4) Connect the X9 connectors together.

Replace the switch area grid and the input and output safety panels.

6.12. Individual UPS signal connection information



The contacts XT1/17-18 are used for directly switching off the inverter and are located in the connection area of the input cabinet above QS9 at the right of the power connections.

Terminals XT1.17 and XT1.18 are connected by a jumper when shipped. When setting up an external EPO switch, the jumper must be removed. The jumper must satisfy the following requirements:

- length: max. 50 m
- cross section: min. 0.75 mm²

7. BATTERY CONNECTIONS

Before connecting the batteries, please read the Battery Manual (10H52168BM00), and the notice and warning label on the UPS or battery cabinet.

**Warning**

Battery fuses are shipped together with the UPS and the battery cabinets. These should only be installed during commissioning. If the battery fuses are inserted beforehand, the built-in intermediate circuit capacitors can explode and damage the UPS.

**Warning**

In the event of malfunction, voltage may be present on the shelves or chassis of the battery cabinet

**Notice**

If externally supplied batteries are used, you must ensure that the applicable EC directives are met and declare conformity. The UPS parameters must still be those of the service software and an all-pole disconnecting device and fuses must be fitted in accordance with Table 5, page 53.

When dimensioning your battery cabling, special attention must be paid to the options for connection to the +/- terminals as per Table 5, page 53. Also note the information regarding special settings provided in the appendix.

The battery cabinet may be installed directly to the right of the UPS.

**Notice for alternative installation**

With enhanced battery management, the distance between the UPS and battery cabinet must not exceed 20 meters. The connection line for the battery measurement module must be installed so that it is properly grounded and so that there is no risk of accidental contact or short circuits. The isolation is to be dimensioned for a rated voltage of 400 V.



Connect the batteries as follows:

- All switches must be in the "OFF" position.
- Check that the battery fuses are not inserted and, if third-party batteries are used, that the external battery switch is open.
- Make the ground connections (PE).
- Connect the batteries with cables according to Table 5 to terminals C+ (positive pole) and D- (negative pole). The battery connection terminals are located on the left hand side of the UPS cubicle (see figures 17 to 23).
- Connect the other end of the battery connection line to the battery cabinet or cubicle. The UPS battery switch is equipped with an electro-mechanical interlock, however, we recommend that YOU CHECK THAT THE POLARITY IS CORRECT!
- Connect the temperature sensor cable to terminals XT1 - 0, 1 and 2 and to the battery cabinet or cubicle.



The UPS battery switch is equipped with an electro-mechanical interlock, however, before the system starts, we recommend that YOU CHECK THAT THE POLARITY IS CORRECT! Wrong connections can damage the system and endanger operator safety.

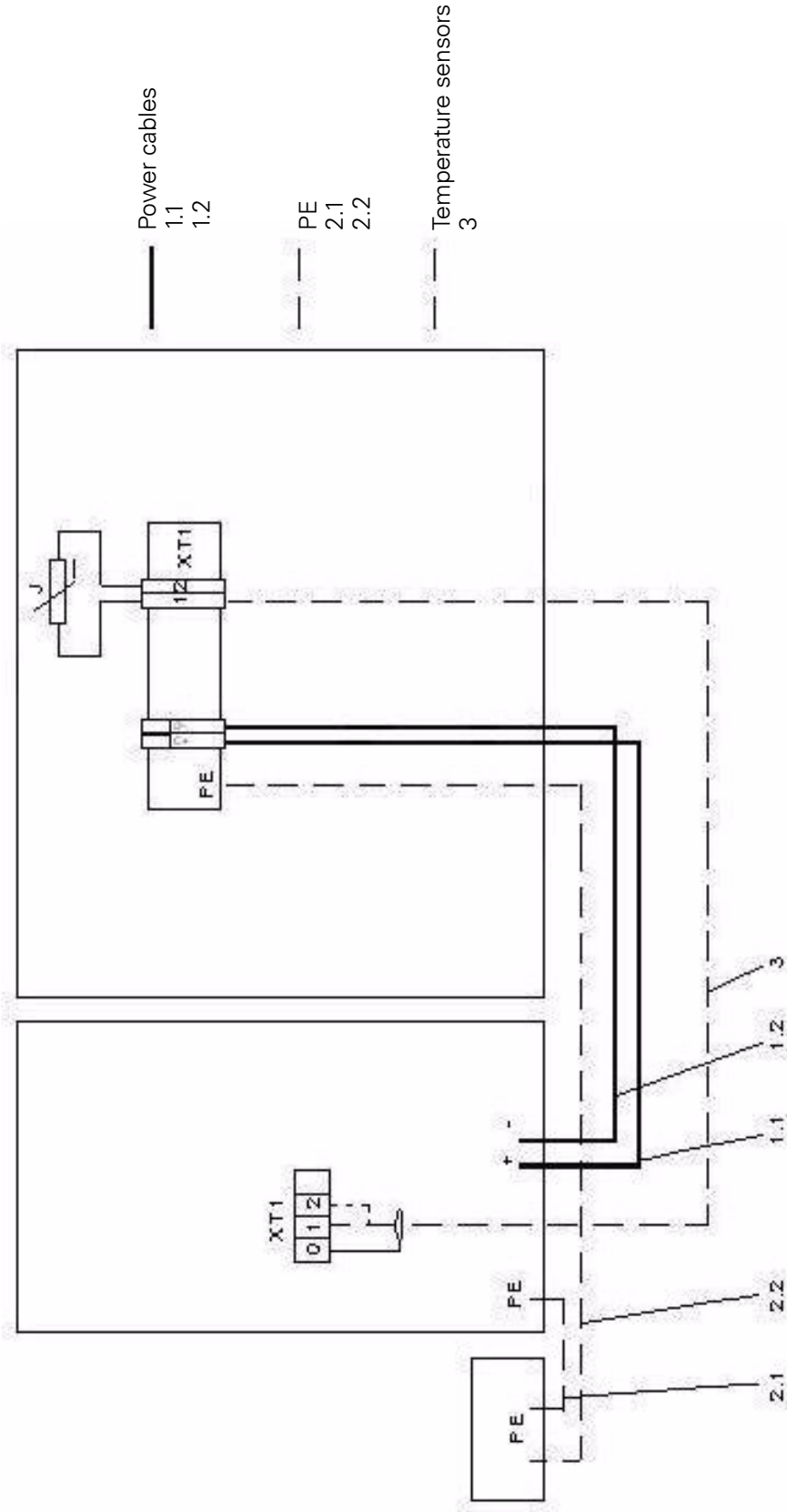
7.1. Battery cabinet connections

All connections listed in the following table are illustrated in Fig. 29

Table 4: UPS - battery connections

Cable No.	Cable designation	Use	UPS connection		Battery cabinet connection
			Terminal	Cable colour	Terminal
1.1	Supplied by battery provider	Power cable	C+		+
1.2	Supplied by battery provider	Power cable	D-		-
2.1	To be supplied by customer	PE	PE	gr/yl	
2.2	To be supplied by customer	PE			PE
3		Temperature sensor	XT1.1	brown	X1.1
3		Temperature sensor	XT1.2	white	X1.2
3		Temperature sensor	XT1.0	shield	

Figure 29 - Battery connection diagram



7.1.1 Handling the batteries

**Warning**

Batteries are a potential source of danger due to their electrical charge and chemical composition. Therefore, observe the battery handling instructions of the manufacturer. These can usually be found in the material which accompanies the shipment.

7.1.2 Recharging batteries

**Notice**

When recharging, observe the instructions on the packaging.

7.1.3 Exchanging batteries

**Notice**

Before exchanging batteries, both the batteries in the battery cabinet, as well as those to be installed must be fully charged.

7.1.4 Connecting batteries

**Warning**

The UPS battery switch is equipped with an electro-mechanical interlock, however, we recommend that YOU CHECK THAT THE POLARITY IS CORRECT!

If the battery was disconnected and is to be reconnected, the battery isolator may only be reconnected after you have made certain that voltage with the correct polarity is present in the intermediate circuit. If the battery is connected to the intermediate circuit while the circuit is de-energised or with incorrect polarity, the intermediate-circuit capacitors could explode!

7.1.5 Stripping down, repackaging

**Danger**

The UPS contains capacitors which continue to store energy for a period of time after the device has been disconnected from the mains supply and battery. This voltage (> 500 V DC) is present at the battery terminals C+ and D-. Before stripping down, check that the UPS and the external mains separation device are switched off and the battery fuses removed. Measure the voltage at the battery terminals and wait until the voltage has dropped to 0 V or wait at least five minutes. Failure to do this can lead to severe electrical shock and even death



Strip down the UPS in the reverse order of that described in the previous sections. Use the original packaging if possible when repackaging.

7.2. Battery calculation settings

When units are despatched from the factory without an associated battery cubicle and, more specifically, if a unit is not Customer Witness tested in conjunction with its final battery system, the autonomy calculation is set to "OFF".

- Battery Calculation Activated (409) = NO on the Battery Calculation Settings page

In such cases it is necessary to load the Battery Parameters during commissioning, in accordance with the following instructions:

N.B. When the unit has been Customer Witness tested in conjunction with its final battery system, the Autonomy Calculation is set to "ON" - Battery Calculation Activated (409) = YES on Battery Calculation Settings page - the parameters have already been loaded and do not need to be modified.

7.2.1 Battery Parameter settings in field

N.B. These settings are the same for both single and parallel UPS, and for both 6 and 12 pulse rectifier units. For information regarding common battery systems please contact your local service support centre.

N.B. Configurations, autonomies and battery suppliers may change without notice, please ensure you have the correct data before inserting battery parameters.

Where non-standard battery configurations are used (i.e. not included in the current official parts list) these are derived using the following calculations (it is necessary to have the battery manufacturer's data sheets, which provide a figure for autonomy as a function of the final voltage at a defined, constant power discharge).

The following calculations shall be made:

$$P_{\text{batt}} = P_{\text{UPS}} \times 0.8/0.92 \quad \text{where: } P_{\text{UPS}} \text{ is the rating of the UPS in VA, e.g. at 400kVA } P_{\text{UPS}} = 400,000$$

$$P_t(511.5) = P_{\text{batt}} / (n\text{-cell} \times n\text{-string}) \quad \text{where: } n\text{-cell is the number of cells for that UPS (e.g. 240), and } n\text{-string is the number of strings in parallel}$$

$$P_t(510.5) = P_{\text{batt}} / (n\text{-cell})$$

$P_t(510.5)$ represents the W/cell for that battery type (see battery spec.)

$P_t(511.5)$ represents the autonomy of the UPS at full load

$P_t(513.5)$ represents the end of discharge voltage, for the stated autonomy

The remaining calibration points can be deduced in the same way, simply by considering other points on the discharge curve, i.e. calculating the autonomy at various points from the minimum (full load) to a reasonable maximum (10% load) and referring to the battery manufacturer data sheets.

Calibration:

$$P_t(512.1) = P_t(510.3) \times n\text{-cell} / 1000$$

$$P_t(512.2) = P_t(511.3)$$

8. PARALLEL

8.1 Installation - COC

- Ambient temperature.....0 + 40°C
- Relative humidity (w/o condensation @ 20°C)..... 90%
- Max. altitude (w/o derating) 1000 m.a.s.l.
- Protection degree (with doors open)..... IP20
- Cable entry bottom/side/top
- Air inlet.....bottom
- Air outlet.....top

Table 5: COC installation data

Description	UM	COC Rating (A)			
Dimensions		400	800	1600	3200
See: on page:		Fig. 30 56		Fig. 31 57	Fig. 30 56
Net weight	kg	300±35	380±35	365±35	675±35
Floor loading	kg/m ²	412	471	588	588
Air flow of fans	m ³ /h	3600			
Max. dissipation (@ nominal load supplied by Reserve)	kW	1.4	2.8	5.6	11.2
	kcal/h	1204	2408	4816	9632
Max. audible noise level (@ 1m)	dBA	60		62	64

STANDARD FINISH:	LIGHT GREY	RAL7035 (frame and panels)
------------------	------------	----------------------------

Figure 30 - Dimensions of COC rating 400/800A

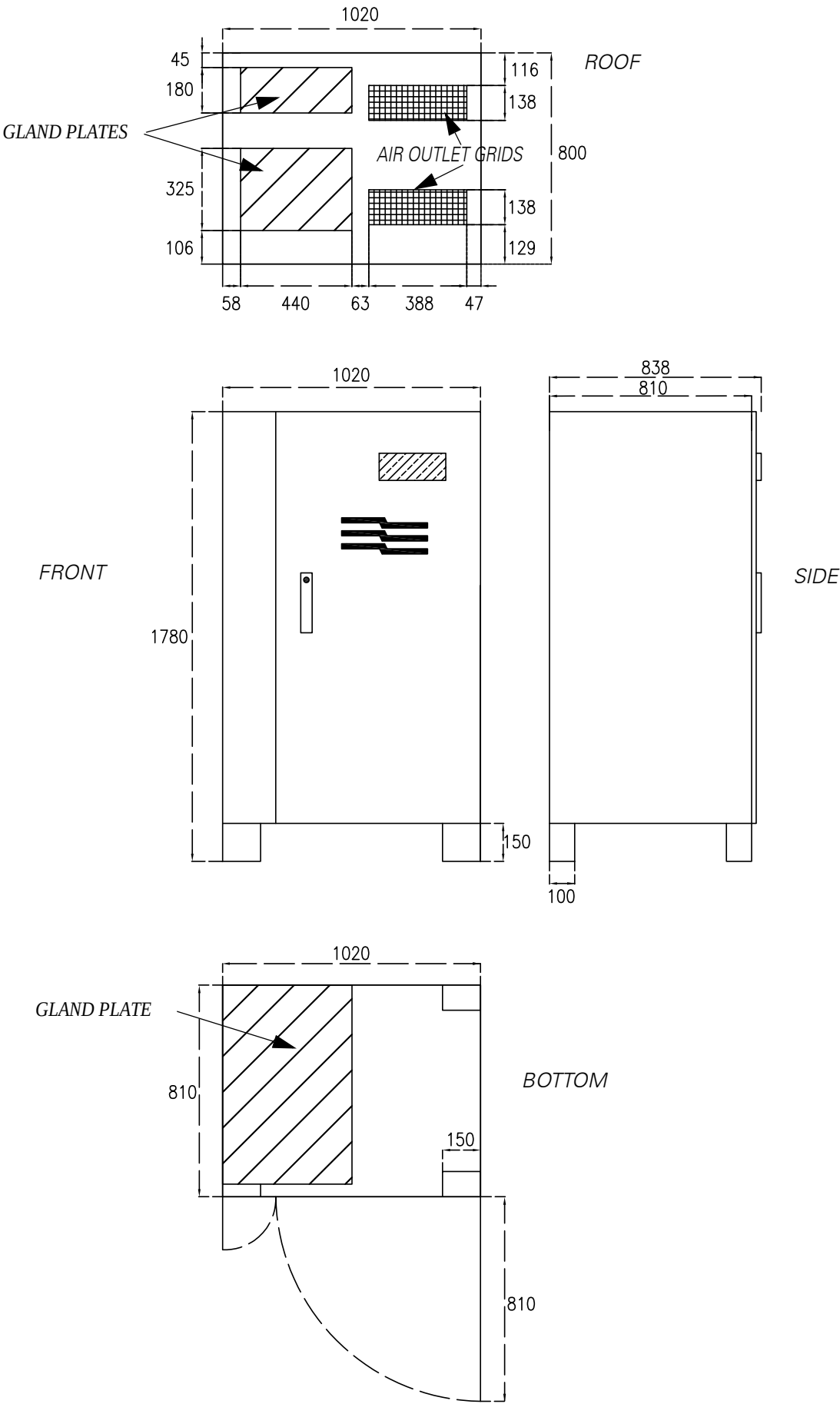


Figure 31 - Dimensions of COC rating 1600A

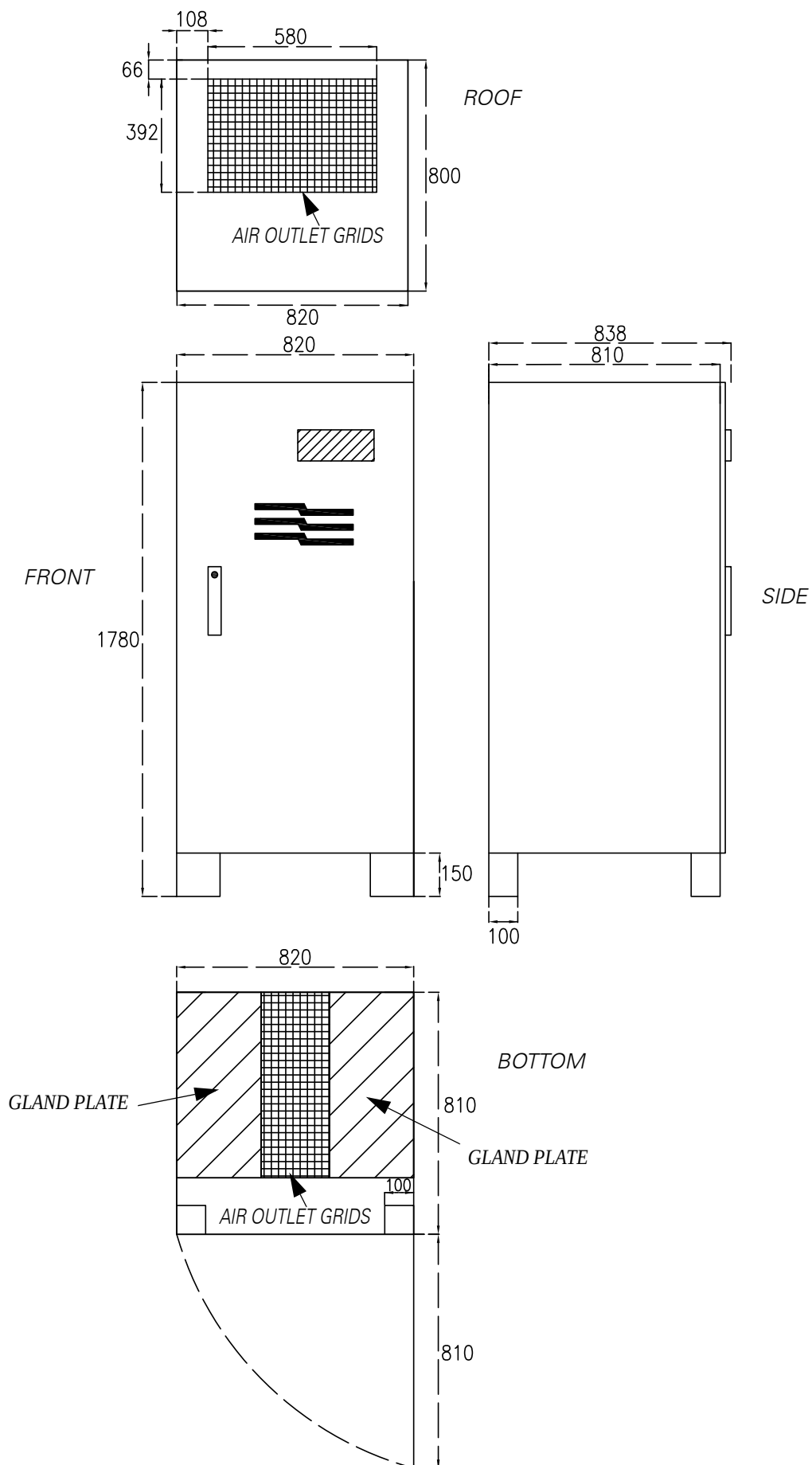
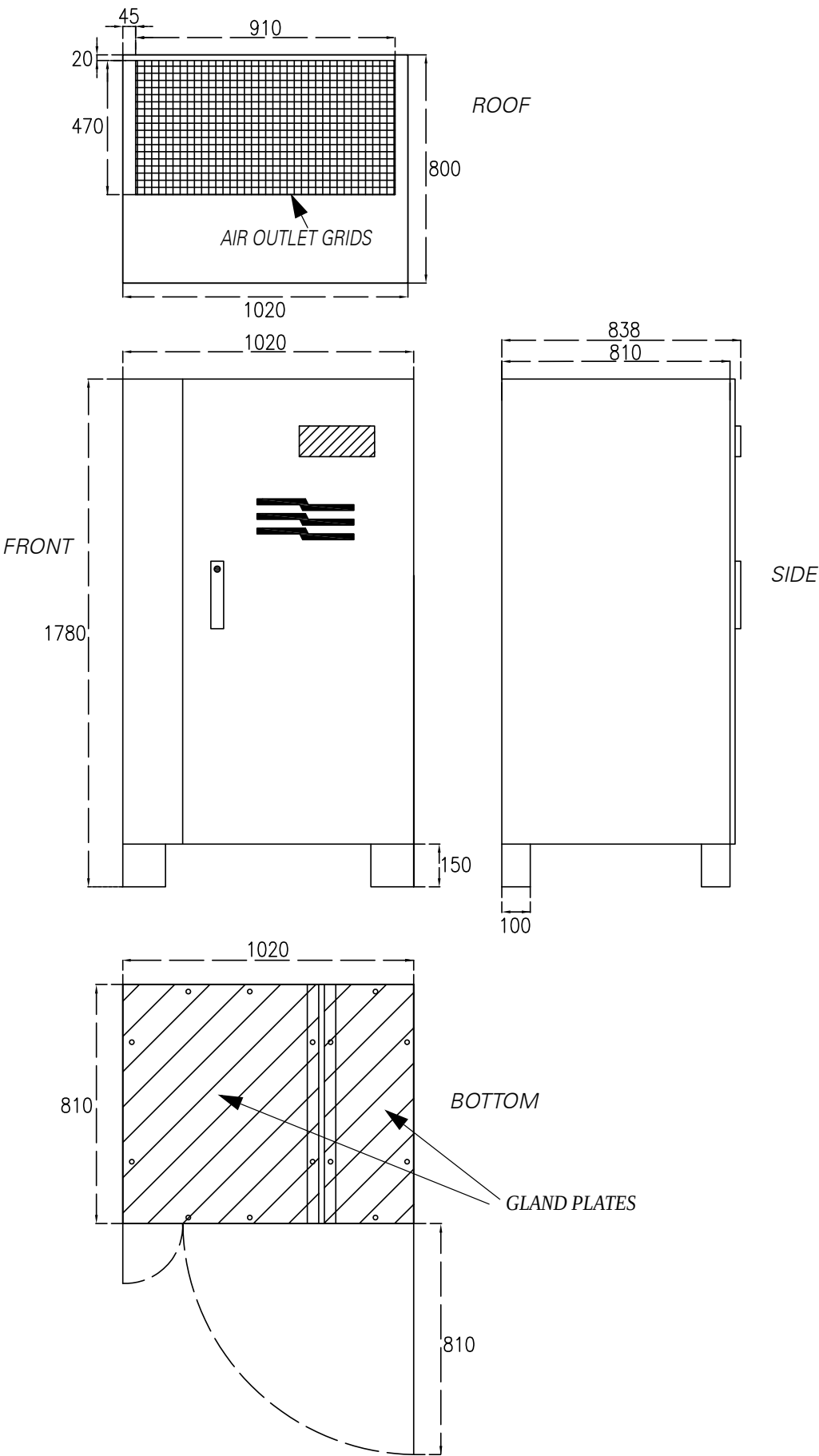


Figure 32 - Dimensions of COC rating 3200A



8.2. Power and signal connections - COC

8.2.1 Power connections



Danger

For reasons of safety the Operator MUST NOT REMOVE the secondary access panel. If, for any reason, it is necessary to remove this panel, the installation must be switched off and de-energised, otherwise complete safety cannot be guaranteed.

The COC is connected to 400/230 V three-phase mains; DC voltages above 500 V are additionally present in the battery circuit. Installation must only be carried out by qualified personnel in accordance with these operating instructions and the regulations of the local electricity provider. The COC devices create a large leakage current; therefore connect to ground prior to commissioning. Improper connection can damage the device and lead to injuries and even death.



Danger

Mains overvoltage: this UPS must be protected against overvoltages deriving from the feeding mains. The device was developed in accordance with the product normative EN 50091-2, which relates to the IEC 1000-4-5. Overvoltages must be planned for in the power supply system, including those caused by lightning strikes as well as those produced internally as the result of switching inductive or capacitive loads, such as power transformers or capacitor banks or as the result of short-circuit shut-downs.



Notice

This device is not equipped with its own mains separation device. You are, therefore, required to provide a mains separation device at the installation site. It must be installed near the device and labelled as the mains separation device for the UPS system. These mains separation devices and all upstream switches must be provided with a warning plate on which the following is stated: "ISOLATE THE UNINTERRUPTIBLE POWER SYSTEM (UPS) PRIOR TO OPERATING ON THIS CIRCUIT".



Notice

QS2 and QS4 are used for disconnecting.

The following table gives indications of cable cross sections and fuse ratings. For mains and load connection use exclusively the screws provided to ensure that the specified air and leakage distances are maintained. The feed can be supplied from either separate (optional, see Fig. 14) or the same mains supply. The load is connected to the load connection.

Cable dimensions are purely indicative. They are applicable only in the following cases:

- copper wire with PVC insulation (max. operating temperature = 70° C, multi-core - to 35 mm², single-core - greater than 35 mm²),
- cables are fitted in separate conduits for each line (input, output, battery),
- air temperature in conduits does not exceed 30° C,
- the maximum number of cables per conduit is 4.
- when laying in channels or for electric installation conduits
- for cable lengths up to 30 m

If conditions are different refer to DIN VDE 0298 part 4. When selecting the conductor cross section, local conditions and standards, as well as application-specific voltage drops due to cable lengths, must be taken into account. If the UPS is to supply predominantly non-linear loads, multiply the quoted cross section for PEN by 1.6.

Recommended earth wire sizes are purely indicative; they may be calculated exactly using the following formula:

$$s = \sqrt{\frac{I^2 \cdot t}{k}}$$

where:

- s = min. earth wire size (mm)
- I²·t = nominal I²·t of the protection device (on the Mains input)
- k = coefficient depending on insulating material (for PVC, max. operating temperature = 70° C, k = 143)

In different conditions, wire size can be calculated in accordance with IEC standard 287.

If the length of the cables causes a voltage drop > 3%, use a larger wire size.

8.3. COC power connection data

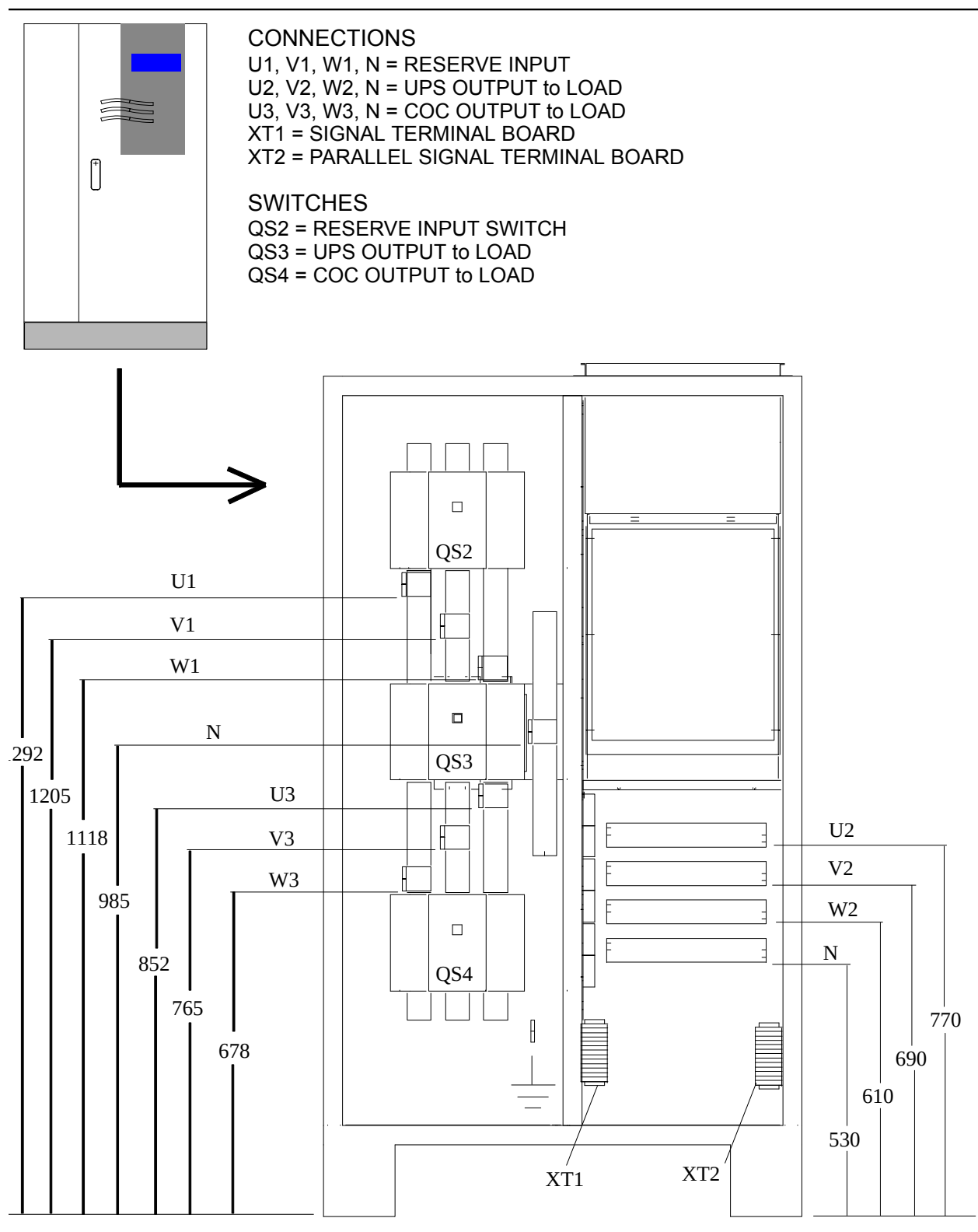
Table 6: power cables section - COC

Description	U.M.	COC Rating (A)			
		400	800	1600	3200
See		Fig. 33		Fig. 34	Fig. 35
on page		61		62	63
Recommended wire size	mm ²	2x95	4x95	5x240	6x240
Recommended wire size for PE earth conductor	mm ²	95	2x95	3x240	4x240
Wire socket screw size	mm	M10	M12		
Tightening torque	Nm	39	68		

Tightening torque	Screw size	Nm (+/-10%)
	M10	39
	M12	68

8.4. 400/800A COC Power connections

Figure 33 - COC 400/800A



8.5. 1600A COC Power connections

Figure 34 - COC 1600A

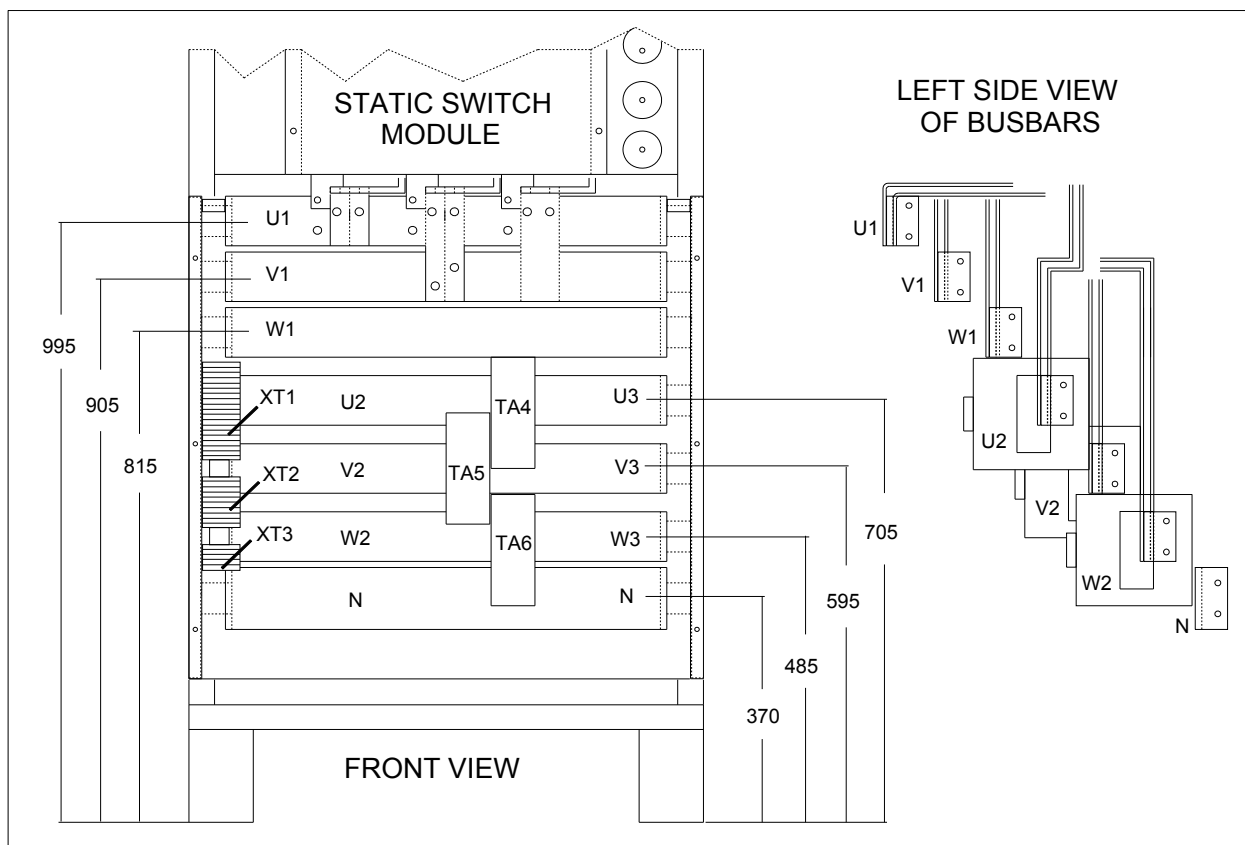
CONNECTIONS

U1, V1, W1, N = RESERVE INPUT

U2, V2, W2, N = UPS OUTPUT to LOAD

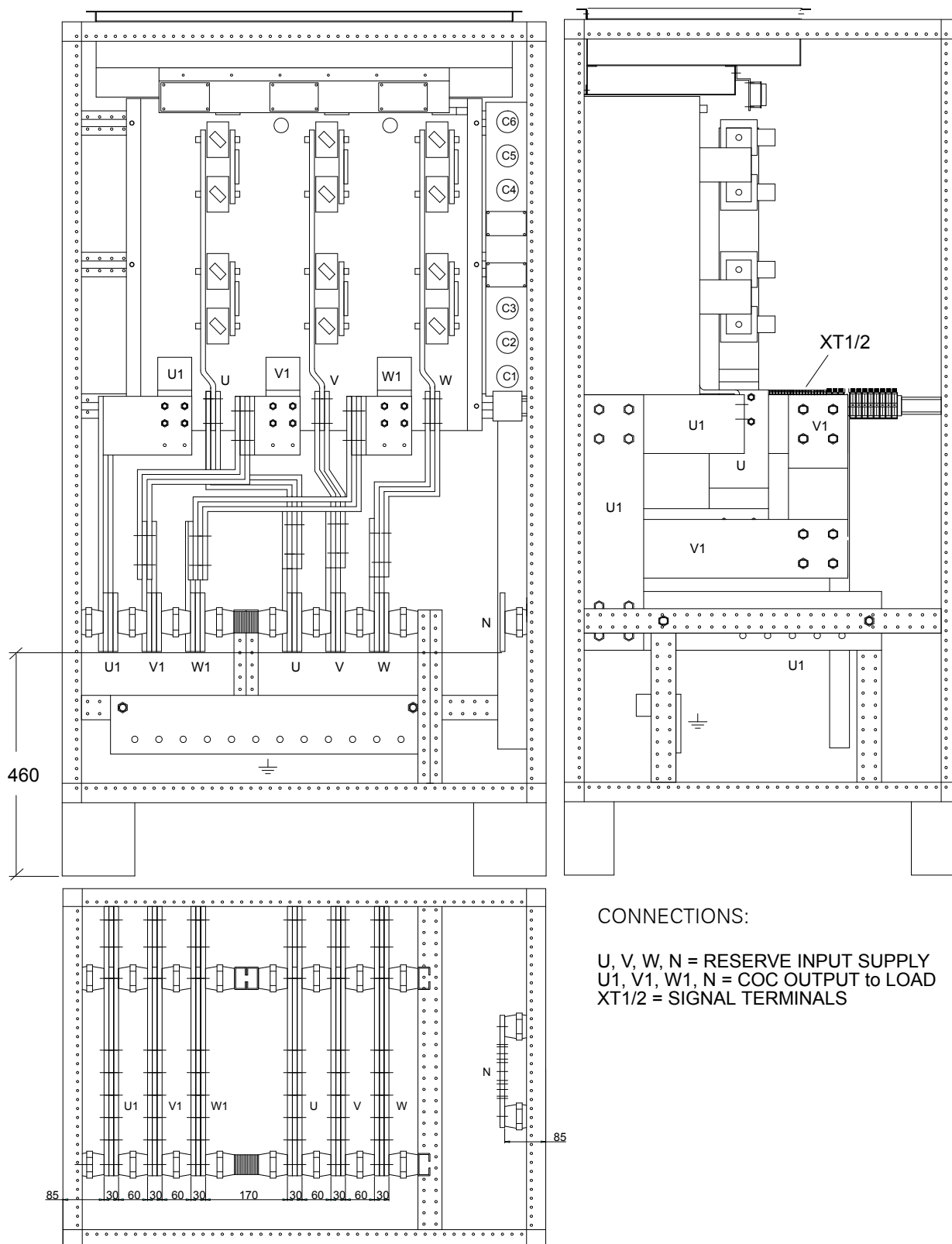
U3, V3, W3, N = COC OUTPUT to LOAD

XT1, XT2, XT3 = SIGNAL TERMINALS



8.6. 3200A COC Power connections

Figure 35 - COC 3200A



8.7. Parallel signal connections

If the 90-NET units are equipped with the additional POB (Parallel Operation Board) assembly, up to 8 UPS of the same rating can be operated in parallel in order to provide either increased power capacity, or additional load security (Redundancy).

A multiple-block system is automatically regulated via the controllers of the individual UPS blocks. The available electronic bypasses of the individual blocks work together, as do the corresponding inverters, to divide the load current between them. All necessary communication for parallel operation is carried out via a shielded 25 conductor cable. Each UPS block is shipped with a cable which is sufficient for most installation requirements.

When planning the system and during installation, power cables of similar length must be used between the input distribution and the input terminals to the bypass and rectifier (U, V, W, and U1, V1, W1, N), as well as from the UPS outputs (U2, V2, W2, N) to the parallel connection point on the load side. Length differences of 20 % are allowed for power cable lengths up to 20 m. For longer distances, cable lengths may not vary more than 10 %.



N.B.

In cases where a parallel system is made up of 90-NET Value Analysis units and 90-NET First Series units, it is necessary to alter the rectifier pwm frequency of the latter to 6kHz. The pwm frequency is set as follows:

From PNU 72 Mains Frequency (nominal frequency) select "2" - Special Frequency so that P77 becomes active.

Set P77.9 VEC_HARM > "240"; P75.29 > "768"; and P75.30 VEC_"TMOD_EIGEN" > 3333 for a pwm frequency of 6kHz.

8.7.1 Commissioning

Commissioning of multiple-block systems must be carried out by appropriately trained technicians.

8.7.1.1 Communication between the UPS blocks

UPS units (and COC where installed) exchange information between each other via the connector cable (25 pin connector) shipped with each unit. Fig. 40 displays the loop circuit which is electronically monitored. The communication cables are shielded and must be routed separately and at a distance from all power cables.

8.71.2. Connecting the 90-NET Parallel Operating Board interface**Notice**

The interface cables must be shielded and located away from the power cables (min. 20 cm). They must be shielded on both sides. Control and power cables must cross at a 90° angle.

This option can also be added at a later time and is, therefore, available as an accessory. It is plugged into the same aluminium housing as the Control Unit board, (see Fig. 36). The interconnections between the Bypass Unit Interface (BUI) board - AP50, the Control Unit board and the POB are modified as shown in Fig. 37.

Figure 36 - POB mounting location

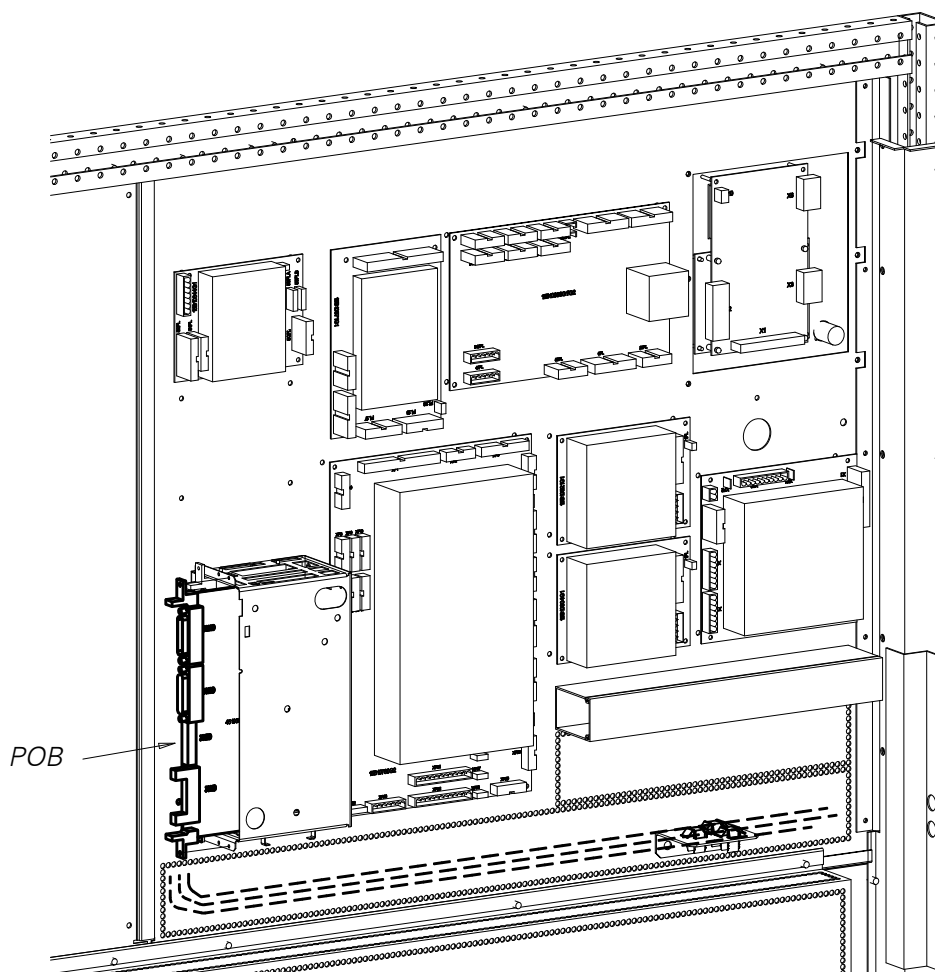
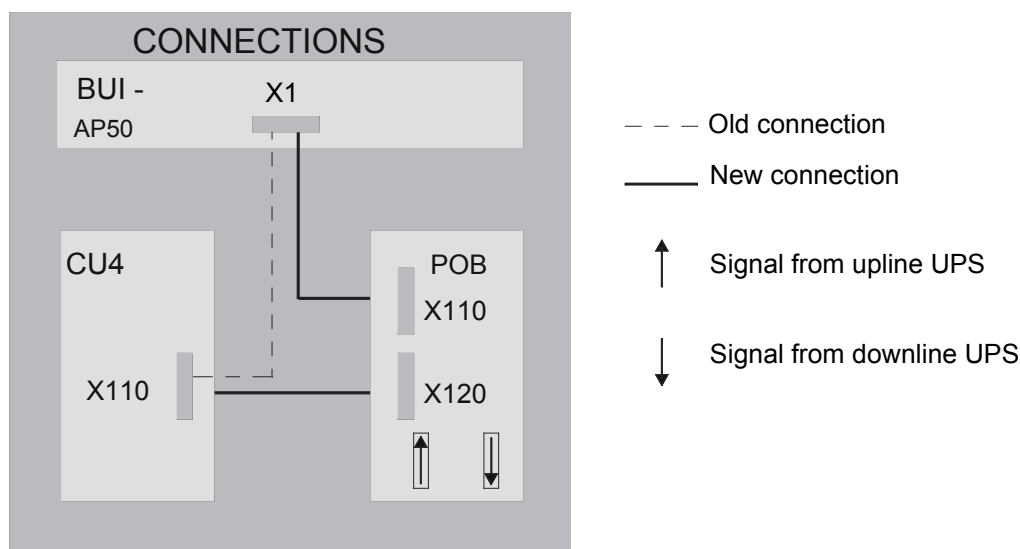


Figure 37 - POB interconnection diagram



The POB cable is guided from the rack downwards to the power cable gland plate. The cable shield must make electrical contact above the mains connection terminals. **To do this, the cable jacket must be removed near the point of contact and fastened using the shielding clamps included with the shipment.**

8.7.1.3. Connecting interfaces

The interface cables may be connected to the connectivity panel (see Fig. 58 on page GB- 141).



Warning

The shielding clamps have sharp edges. Danger of injury!

Figure 38 - Inserting the shielding clamp

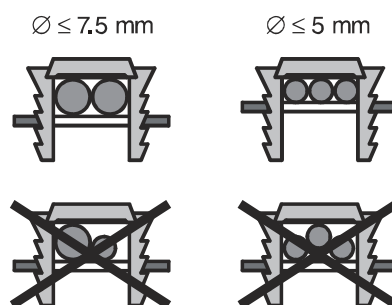
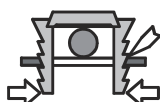
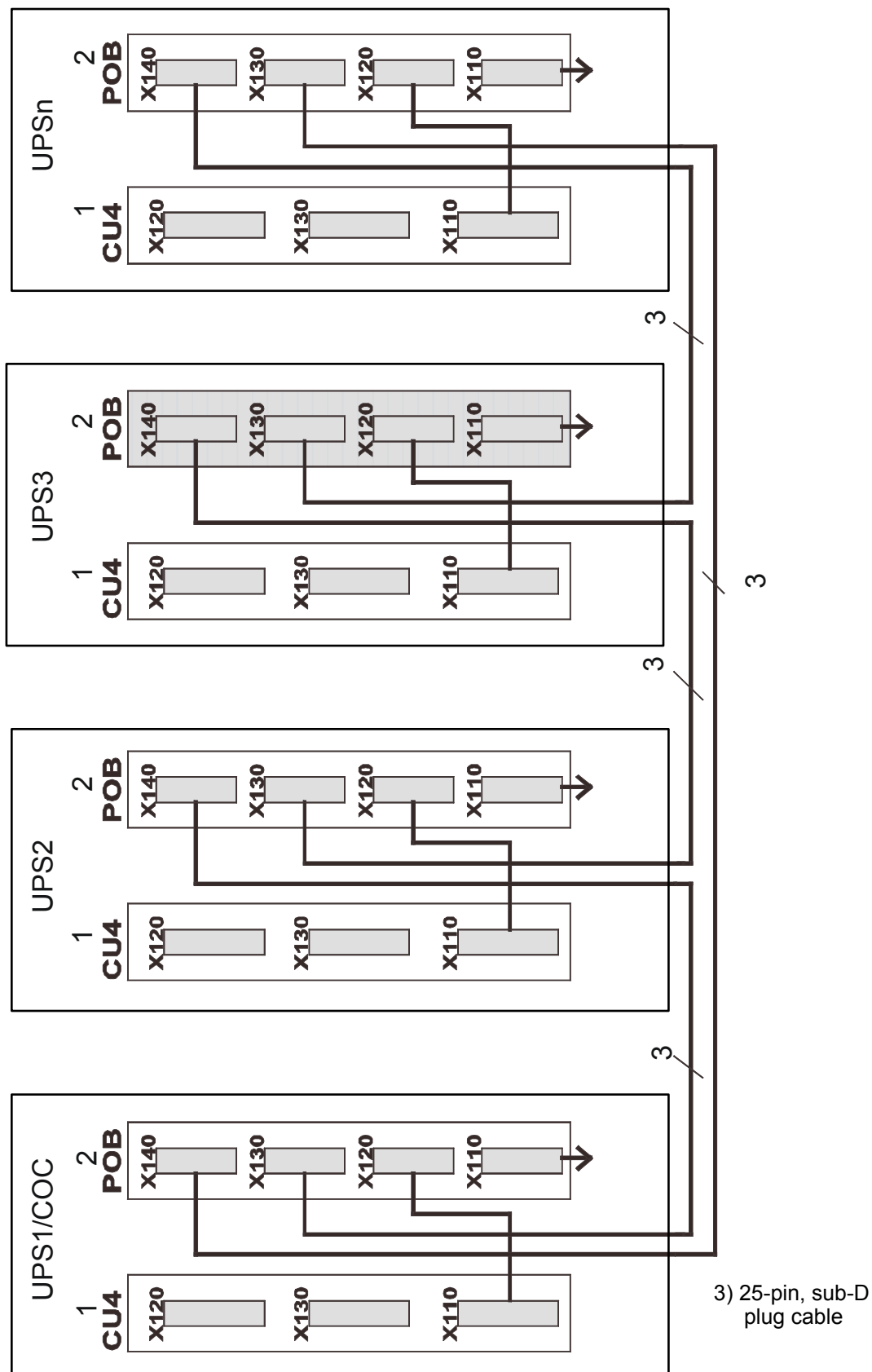


Figure 39 - Removing the shielding clamp



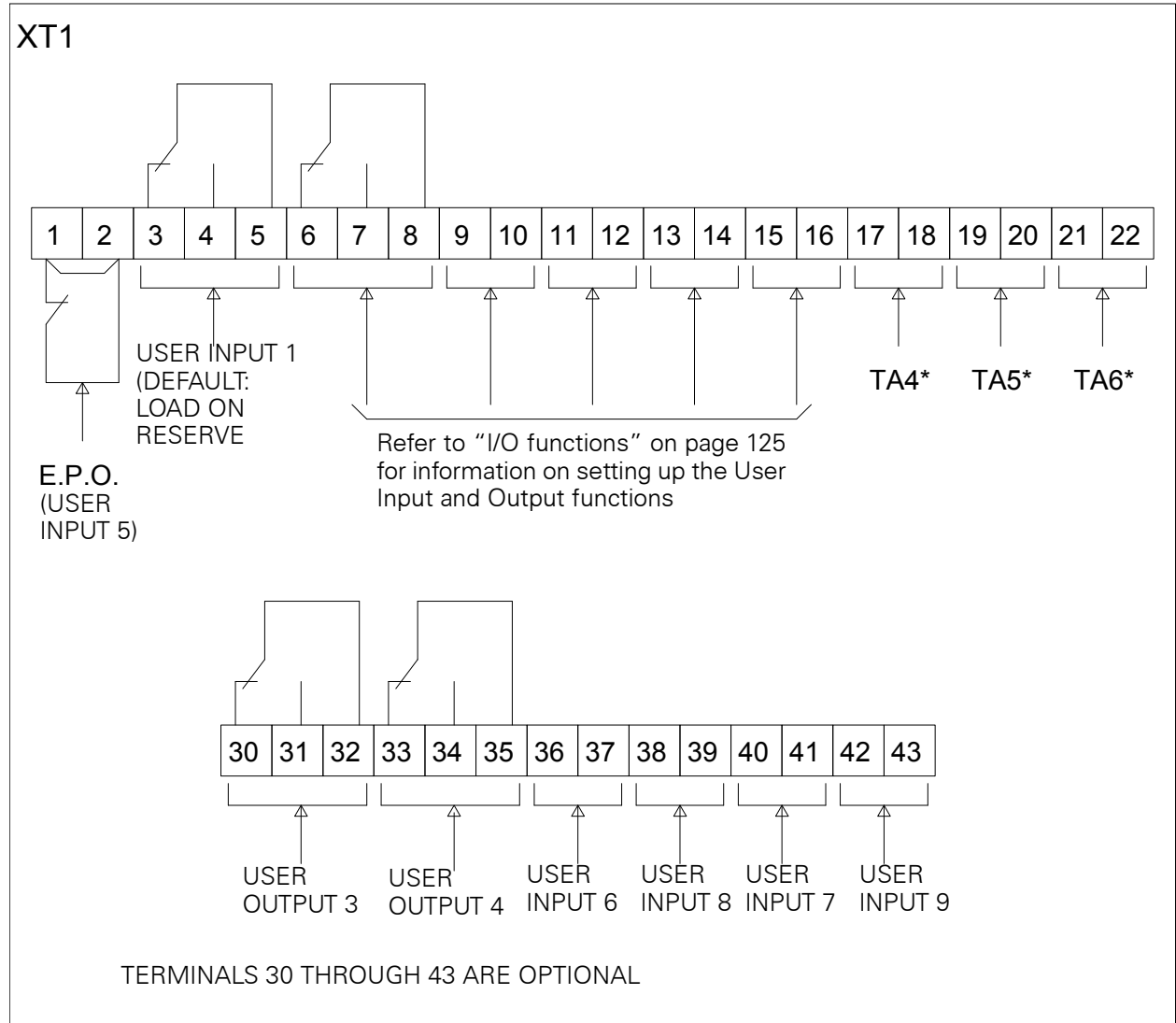
Press the clamp home by hand; use a screw driver to lever it off.

Figure 40 - Connections and loop circuit (25-pin plug) for example 4-block system

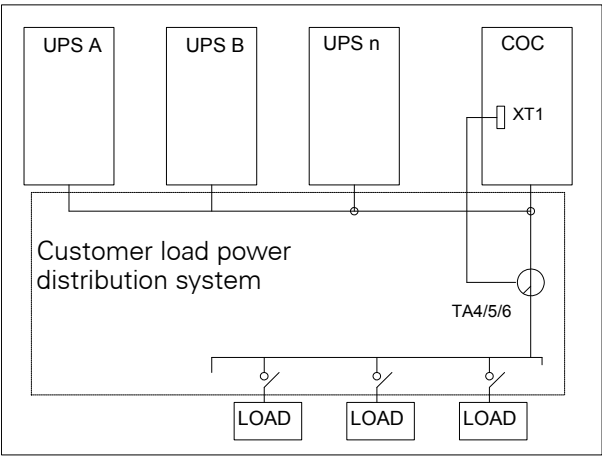


8.7.2. CENTRALISED parallel system signal connection data

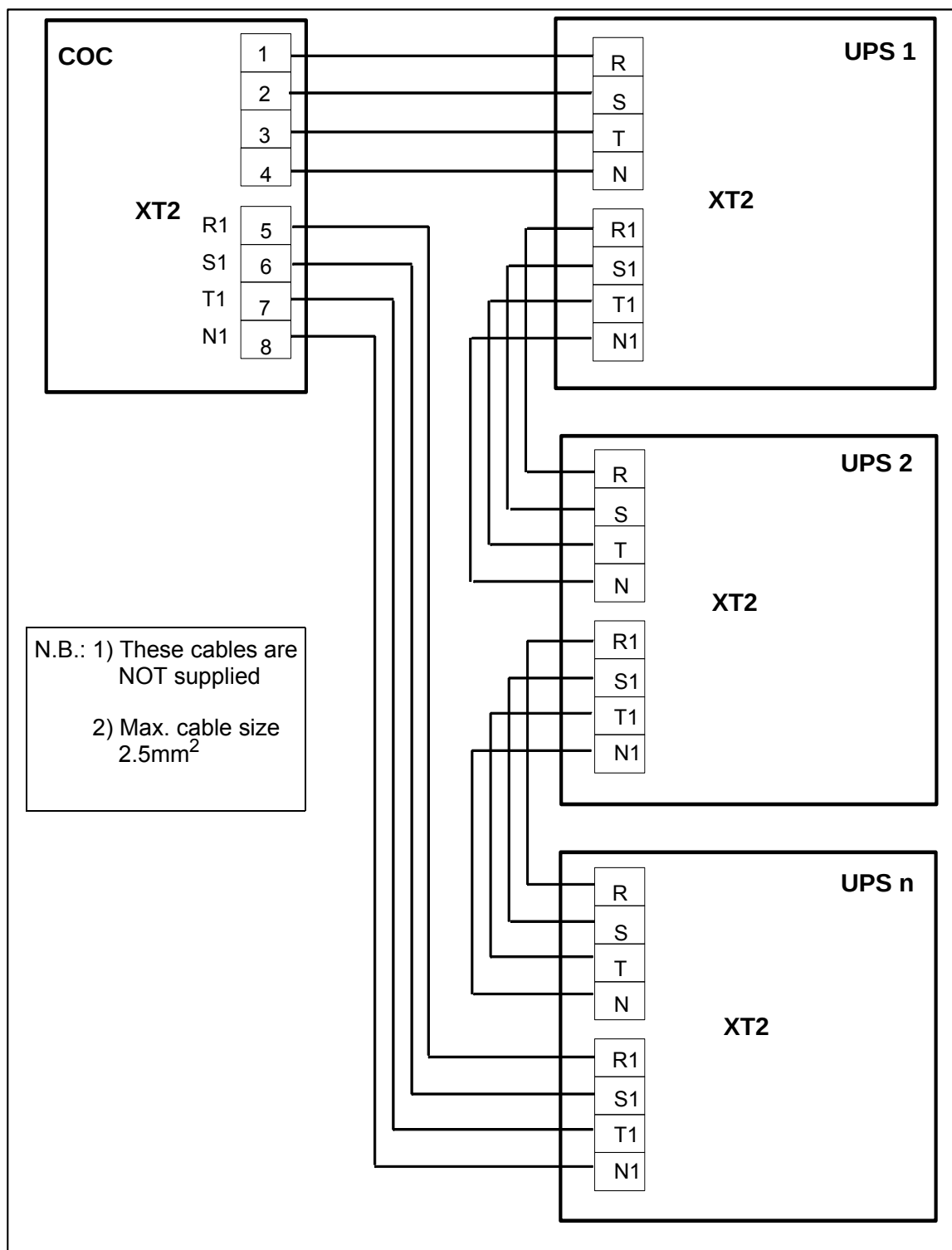
XT1 - COC signal terminal board connections



* 3200A rating only: Install the three Customer Distribution current transducers (TA4, TA5, and TA6 - supplied), on the customer load power distribution system phases R, S, and T, respectively (see below), and connect them to the terminals of XT1 as illustrated above.



Notice
The C.O.C. 1600A and 3200A ratings do not include switching devices. These must be supplied and installed by the customer. It is strongly advised that the status (Open/Closed) of such devices be monitored by means of auxiliary contacts. Contact CHLORIDE Technical Support for more information.

Terminal signal connections for CENTRALISED PARALLEL SYSTEM with Common Output Cubicle (C.O.C.)

N.B. The above connections do not apply to Centralised Parallel systems with COC, that are configured for HFC (High Fault Clearance).

9. SYSTEM DESCRIPTION

9.1. Function

The 90-NET Uninterruptible Power System (UPS) totally isolates the load from the AC mains supply, protecting it from voltage drops, spikes, transients, RFI and frequency variations.

In the event of total or partial AC mains power failure, an internal alarm will sound. The 90-NET will continue, without interruption, to provide power to the load from the sealed battery. Duration will depend on battery capacity and output load. The audible alarm and the indication of available autonomy allows the user to shut down the load without haste. When the AC mains supply is restored, the 90-NET automatically recharges the batteries, ready for any power failure emergency. The display panel gives access to extremely detailed information regarding the status of supply and the 90-NET. For further information, consult this manual.

The block diagram (Fig. 42) shows the main features of the 90-NET UPS. The AC three-phase supply is rectified to provide direct current to maintain the battery charge and also to supply energy to the Inverter, which converts continuous voltage into AC three-phase voltage.

The load may be powered from two sources: the Inverter and the Reserve input. The Output Static Switch allows inputs to be supplied alternatively from these two independent three-phase sources, thereby increasing system reliability.

In order to effect continuous switching between the Inverter and the Reserve supplies, the Inverter synchronises its output frequency with the reserve supply frequency. If the reserve supply frequency is out of the limits, the Inverter ceases synchronisation with reserve frequency, operating with its own reference control to stabilise frequency output. This feature, in conjunction with the static switch, provides a continuous, reliable load power supply.

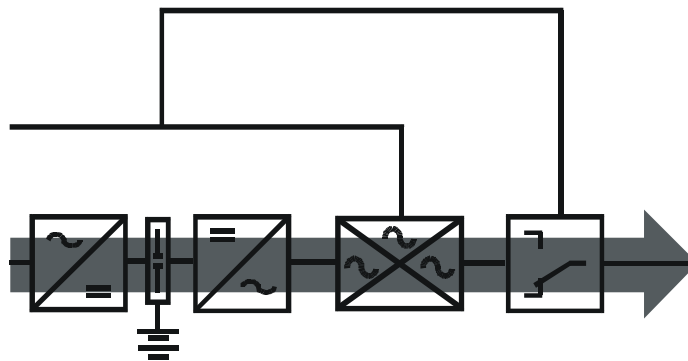
Maintenance and checking can be performed on the 90-NET UPS, without interrupting output, by simply switching the load to the reserve supply and then to the by-pass circuit. This operation should only be carried out by a CHLORIDE service engineer or by CHLORIDE-trained personnel.

9.1.1 On-line Double Conversion operating principle

This UPS operates according to the On-line Double Conversion principle. In On-line Double Conversion operation, the alternating voltage of the mains is converted into DC voltage. This DC voltage is used simultaneously to charge the battery and supply the inverter. The inverter converts the DC voltage into interference-free AC voltage at a fixed frequency and amplitude. The connected loads are supplied by this AC voltage. This protects the load from mains supply disturbances and provides a secure mains supply for electrical loads (PCs, network servers, multi-console systems).

In case of a mains failure, the batteries provide uninterrupted power to the loads via the Inverter.

Figure 41 - UPS On-line Double Conversion operation



9.1.2. Digital Interactive mode

With priority set to Digital Interactive mode, intelligent double conversion technology allows 90-NET continuously to monitor the condition of the input supply, including its failure rate, in order to ensure maximum reliability for critical users. Based on the analysis performed, it decides whether the load should be supplied from the direct, or the conditioned line.

9.1.2.1

Operating mode depends on the recent quality of the mains. If the line quality has been within allowed tolerance levels, the direct line continuously supplies the critical AC load via the static switch. The IGBT inverter is always on and synchronised with the direct line. This ensures that the load can be transferred to the conditioned line, without any break in supply, when there is any deviation from the pre-established input power tolerance levels.

If the direct line failure rate has been outside the allowed parameters, 90-NET shall supply the load via the conditioned line. The battery charger supplies the energy necessary to maintain the maximum charging level to the battery.

9.1.2.2. Inverter stop or overload

If the Inverter has been switched off, either by the operator or due to an overload, the load cannot be transferred to the conditioned line, and continues to be supplied by the direct line.

In the event that an overload lasts longer than the maximum specified period, the load is transferred from the conditioned line, to the direct line, if the mains voltage and frequency are within tolerance.

With the load supplied by the direct line, even if overload timeout is reached, there is no interruption in supply, and retransfer to the inverter is inhibited until the load falls below 95% of its nominal value.

The relevant parameters may be configured in order to achieve a number of alternative operating modes under such conditions.

9.1.2.3. Emergency (the mains supply has failed or is outside tolerance limits)

If 90-NET is supplying the load via the direct line, and the mains supply goes outside the tolerance levels (these can be altered, using the software, from $\pm 2\%$ to $+10\%$ -8%), the load is transferred from the direct line to the conditioned line. The load is supplied from the mains via the rectifier and inverter, provided the input mains remains within $\pm 25\%$. When the input mains is outside these limits the batteries are used to power the load via the inverter. The user is alerted to the battery discharge by visual and audible alarms and the autonomy remaining is displayed on the LCD. During this stage, it is possible to extend the autonomy remaining by turning OFF non-essential loads.

9.1.2.4. Return to normal conditions

When the mains supply returns within tolerance limits, 90-NET continues to supply the load via the conditioned line for a period of time dependant on the direct line failure rate (the conditioned line draws power from the mains not the battery). When the direct line has stabilised, 90-NET returns to normal operation. The battery charger automatically begins to recharge the battery, so that maximum autonomy is guaranteed in the shortest possible time.

9.1.3. Battery management

The battery is charged and discharged, as well as monitored, using microprocessor control. This ensures optimal usage of the batteries' usable lifetimes. For details, see section "Special features".

9.1.4. Overload capacity

In the event of overload (e.g. 150 % of the nominal load) or inverter failure, the load is supplied directly by the mains supply via the automatic bypass. As soon as the system returns to normal operating conditions, it automatically switches back to inverter operation.

9.1.5. Communication

The UPS offers several interfaces for communication with networks and computers. Further information is included in para 14. on page 141.

9.2. Special features

9.2.1. Safe and reliable operation

- real On-line Double Conversion operation, i.e. complete isolation of the load from all irregularities in the mains supply
- electronic bypass increases the availability of the electrical supply electrical isolation for load protection

9.2.2. Easy installation and operation

- compact construction
- parameters set using PC software (provided)
- easy to follow operating and display concept:
 - presence of operator unnecessary during normal operation
 - simple LED indications give a clear indication of the operating condition of the Rectifier/charger, Battery, Inverter, Reserve supply and Load/static switch, providing information about the status of each subassembly, any alarms or indications which may be active and a range of measurements, useful in monitoring the operation of the UPS. (See para 10.1. on page 83 for a detailed description).
 - The LCD also provides assisted start-up, shutdown, bypass and return to normal operation routines, along with full access to the UPS operating parameters.
 - The two buttons on the right of the display control the main operation of the UPS (see para 10.1. on page 83 for more information).
- event memory for fault analysis
- fault display and audible signal (with the facility to shut off the unit).

9.2.3. Battery management

- automatic battery management ensures maximum battery life
- automatic battery circuit test
- temperature-dependent charging

9.2.4. Environment, EMC

- EMC limit values guaranteed to comply with European regulations and standards
- energy savings due to high efficiency
- low noise level
- low mains pollution through 12 pulse rectifier and filter

9.2.5. Modern technology

- interfaces with software for all operating systems
- digital signal processor and vector control for inverter optimisation
- IGBT power transistors
- highly integrated digital electronics (ASICs)
- especially well suited for computer loads

The 90-NET UPS can be used as a 50/60 Hz frequency converter or vice versa.

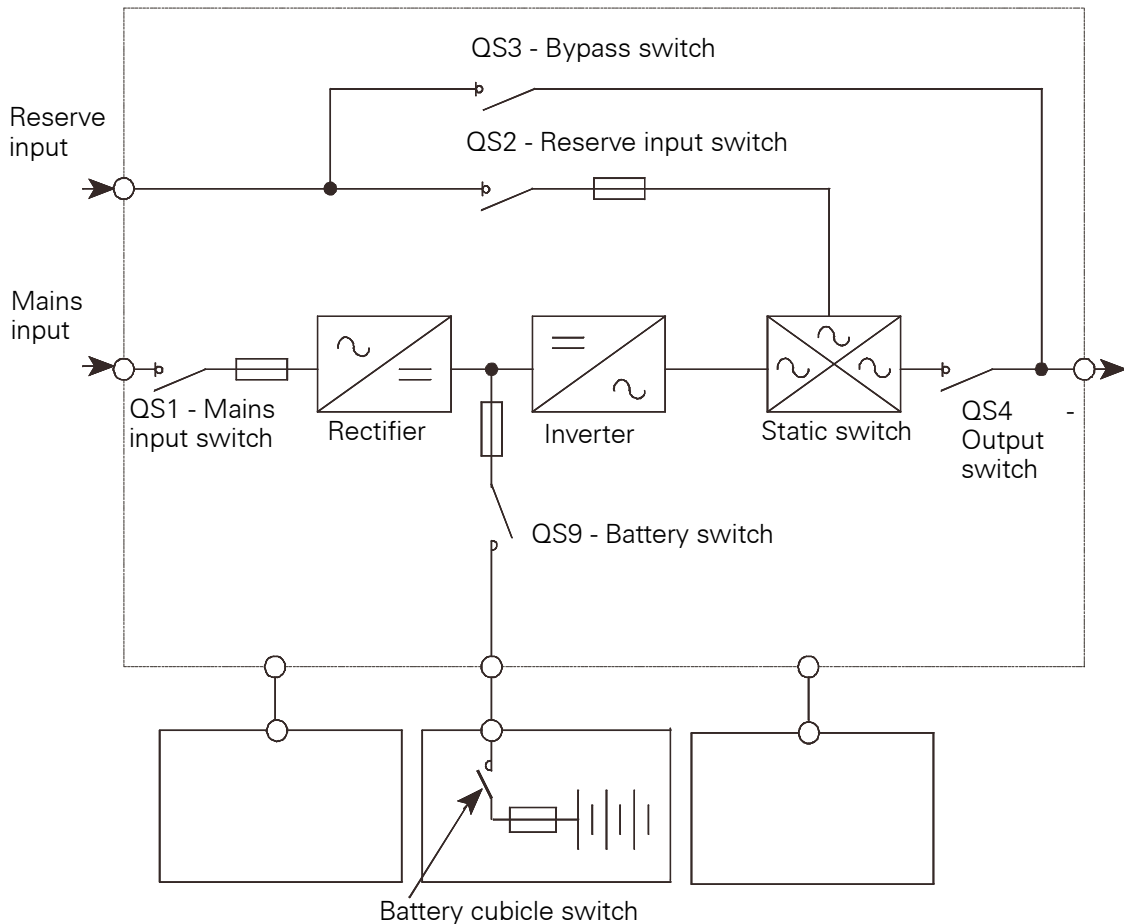
9.3. Block diagram

9.3.1 Components

The UPS consists of the following sub-assemblies

- input filter
- rectifier, filter and inverter
- output transformer with filter for forming the three-phase sinusoidal output voltage
- electronic static switch
- maintenance bypass switch allows maintenance work to be carried out without interrupting supply to the load.

Figure 42 - Overview UPS components



9.4. Switch positions and corresponding operating modes

- If QS1, QS9, QS2 and QS4 are switched on and QS3 (see Fig. 42) is switched off, the UPS is in "on-line operation". Depending on the mains and load condition, the device can switch automatically to "battery operation" or "reserve operation".
- If QS1, QS2 and QS3 are switched on and QS4 is switched off, the UPS is in service bypass operating mode: all UPS components are live. The loads are supplied directly from the mains via the service bypass switch. This setting is designed to test the UPS functions when it is not possible to interrupt the supply to the loads.
- If QS3 only is switched on and QS1, QS2 and QS4 are switched off, the UPS is, again, in service bypass operating mode: if battery isolator QS9 is open then the UPS components are free from voltage, so that maintenance work on the UPS can be carried out.



Warning

Allow approx. 10 minutes for discharging D.C. capacitors after opening QS9.

9.4.1 Service bypass switch

The service bypass switch is located inside the UPS.



Warning

The service bypass switch can only be accessed by qualified personnel, and with the UPS device open.



Warning

During parallel operation of UPS units, the load switching function of the built-in service bypass must be effected by an external switching device (see Fig. 8.7 - on page 64)

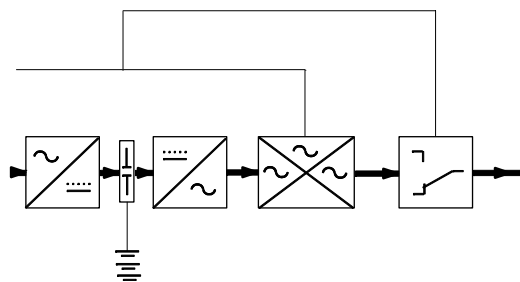
The service bypass switch is required to enable service to be carried out, it is also essential during commissioning and when the device is to be put into and taken out of operation. The supply to the load is not interrupted during switching.

9.5. Operating modes

The UPS has six different operating modes. These are described below.

9.5.1 On-line operation

Figure 43 - Power flow in on-line operation

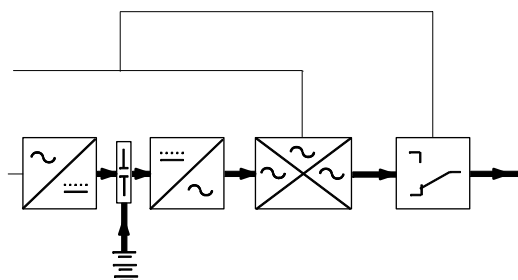


Normal UPS operating mode. The connected loads are supplied from the mains via the converter. The batteries are charged as necessary.

The inverter reliably filters mains disturbances and provides a stable, interference-free supply to the load. In this operating mode, if a mains failure occurs, the UPS switches to battery operation. If an overload or short circuit occurs at the UPS output, or if there is a fault in the inverter, the UPS switches to bypass operation.

9.5.2 Battery operation

Figure 44 - Power flow in battery operation



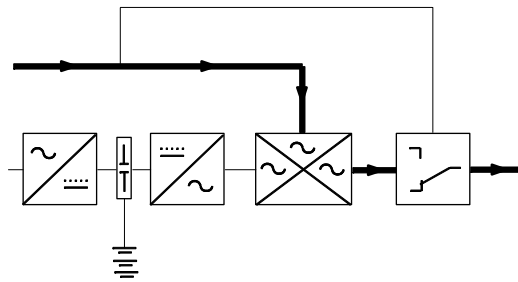
In this mode, the connected load is supplied from the batteries via the inverter.

In the event of power failure, battery operation is automatically activated and supplies the loads interruption free.

The UPS automatically returns to on-line operation, within the backup time, once the mains supply returns. If the power failure exceeds battery autonomy, the UPS provides relevant information via its interfaces. Computers can be automatically powered down by means of additional software (optional).

9.5.3. Reserve operation

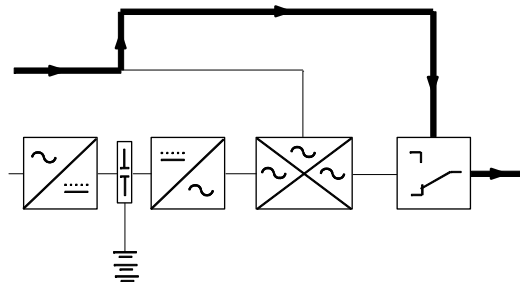
Figure 45 - Power flow in reserve operation



In this mode, the connected loads are supplied from the mains via the electronic bypass. The electronic bypass serves to further ensure power to the loads. If an overload or short-circuit at the UPS output occurs, it is automatically activated to ensure uninterrupted power supply to the loads. From this operating mode, the UPS automatically returns to on-line operation after the fault is corrected.

9.5.4. Service bypass

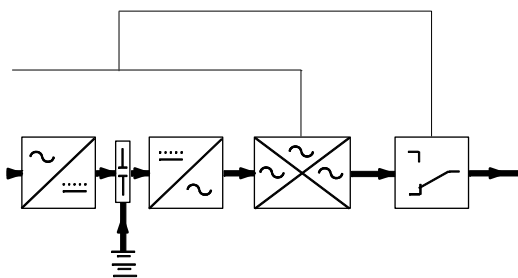
Figure 46 - Power flow in service bypass operation



In this operating mode, the connected loads are supplied directly from the mains supply. The service bypass is used to supply the connected loads with voltage during maintenance work on the UPS. In service bypass operation mode, service bypass switch QS3 is switched on, QS4 is switched off and QS1 and QS2 are either switched on or off, depending on whether or not the UPS components should remain under voltage. By switching on QS2 and QS4 and switching off QS3 the UPS can be switched into bypass operation, without interrupting the load supply.

9.5.5. Battery test

Figure 47 - Power flow during battery test



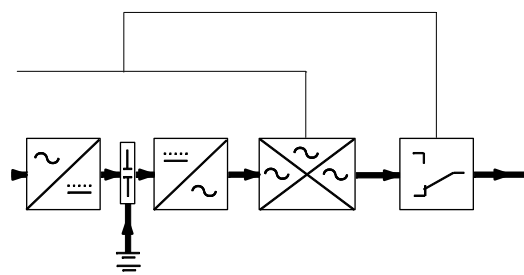
In on-line operation during battery test, energy is drawn from the battery. This takes place automatically every 7 days minus 5 hours following the last test or after switching on. The test lasts one minute. However, the test will not be performed within two days of:

- rectifier mains failure
- mains switch QS1 open
- battery discharge
- bridge monitoring failure

This prevents the test being carried out on discharged batteries.

9.5.6. Frequency converter operation

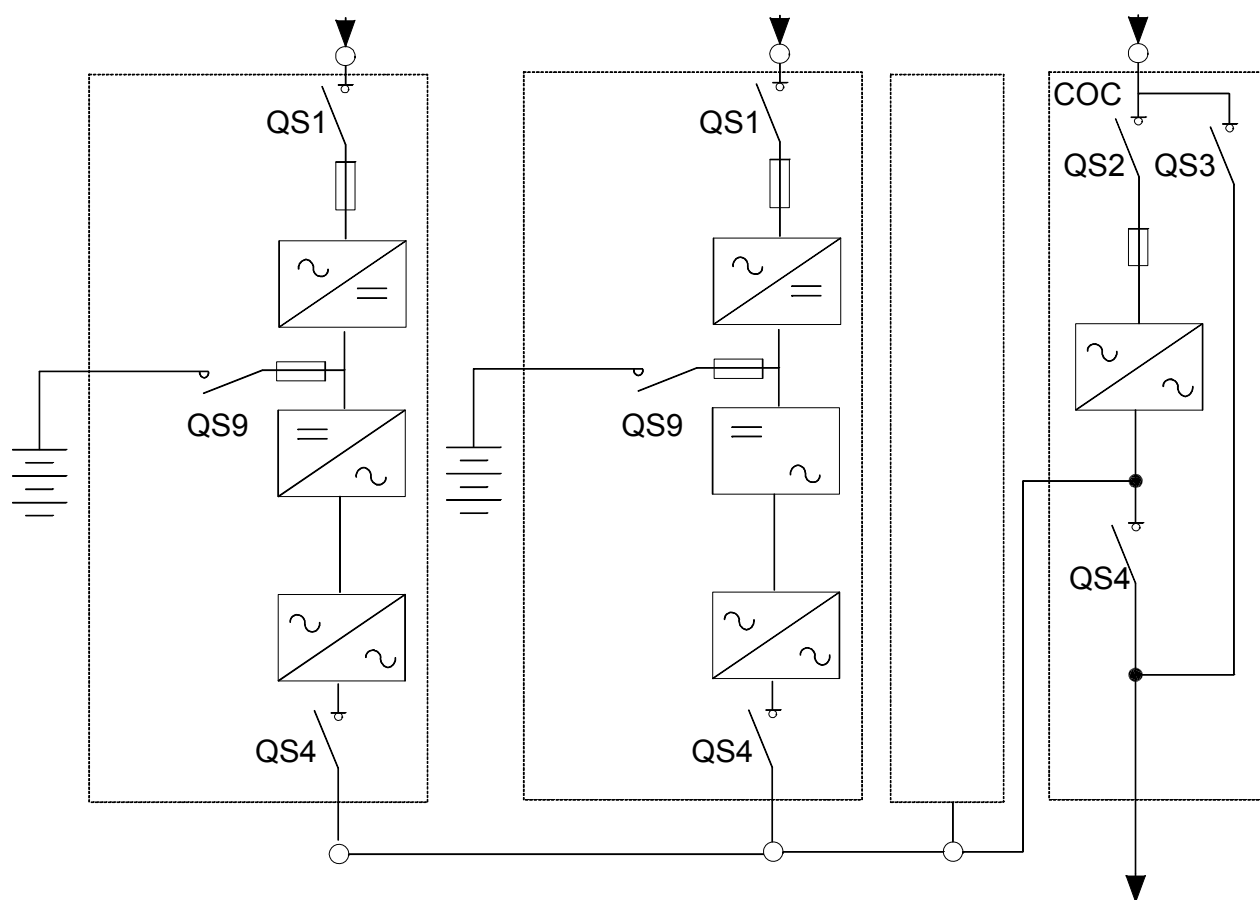
Figure 48 - Power flow in frequency converter operation



The "Line" LED is not illuminated since the bypass is not ready or not present.

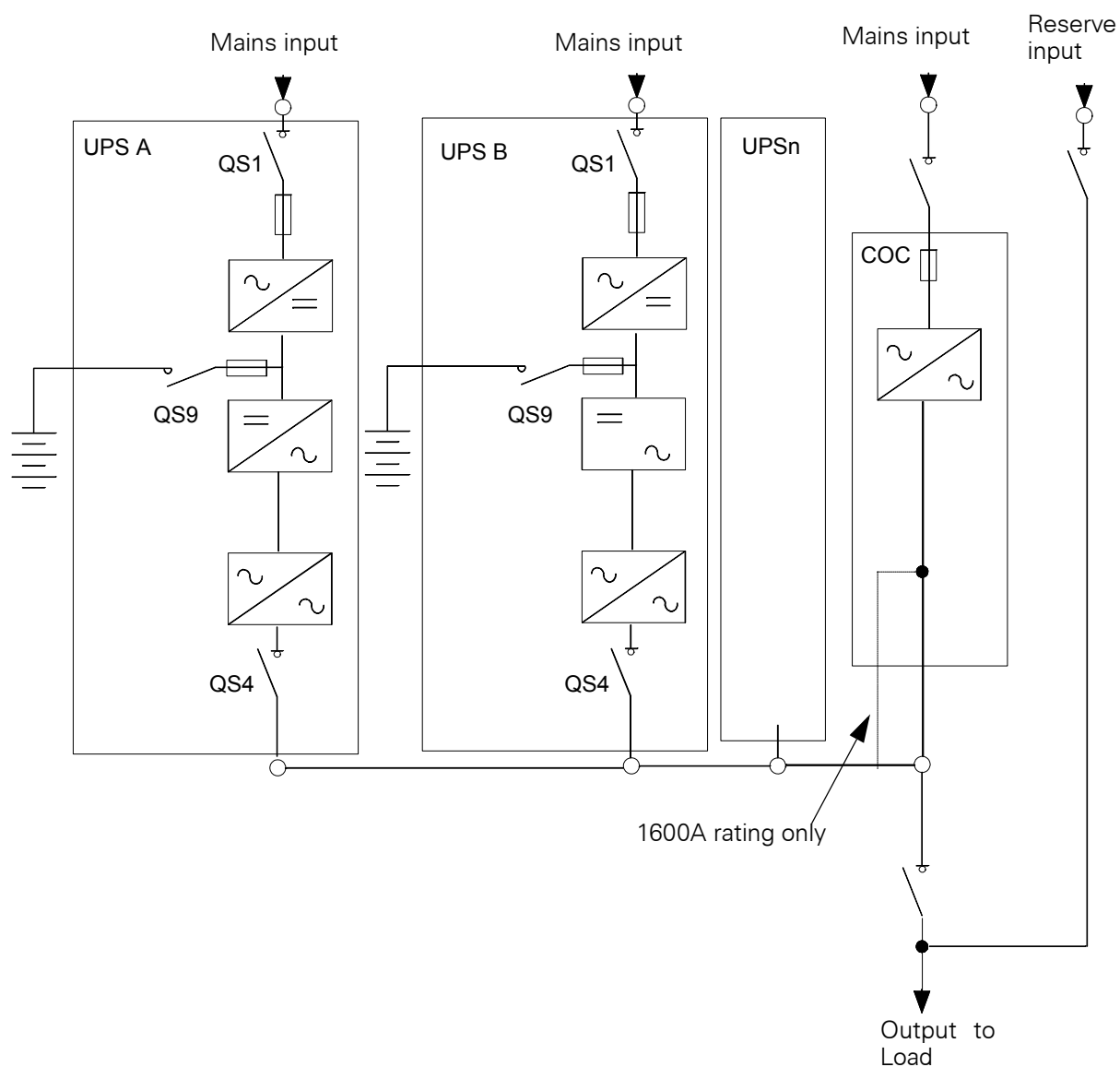
9.5.7. Parallel COC (centralised) electrical connections

Figure 49 - Centralised parallel system electrical connections - 400/800A



9.5.8. Parallel COC (centralised) electrical connections

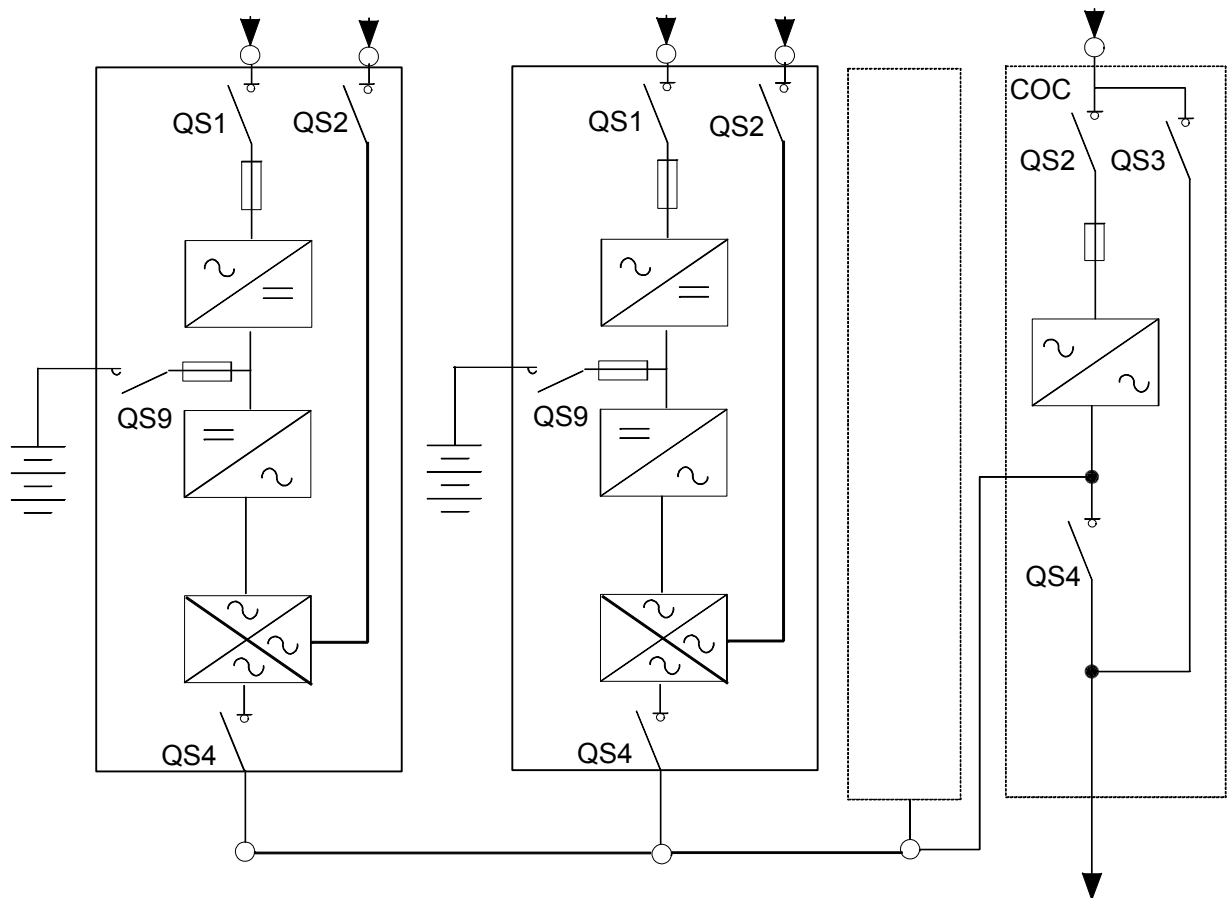
Figure 50 - Centralised parallel system electrical connections - 1600/3200A



Notice

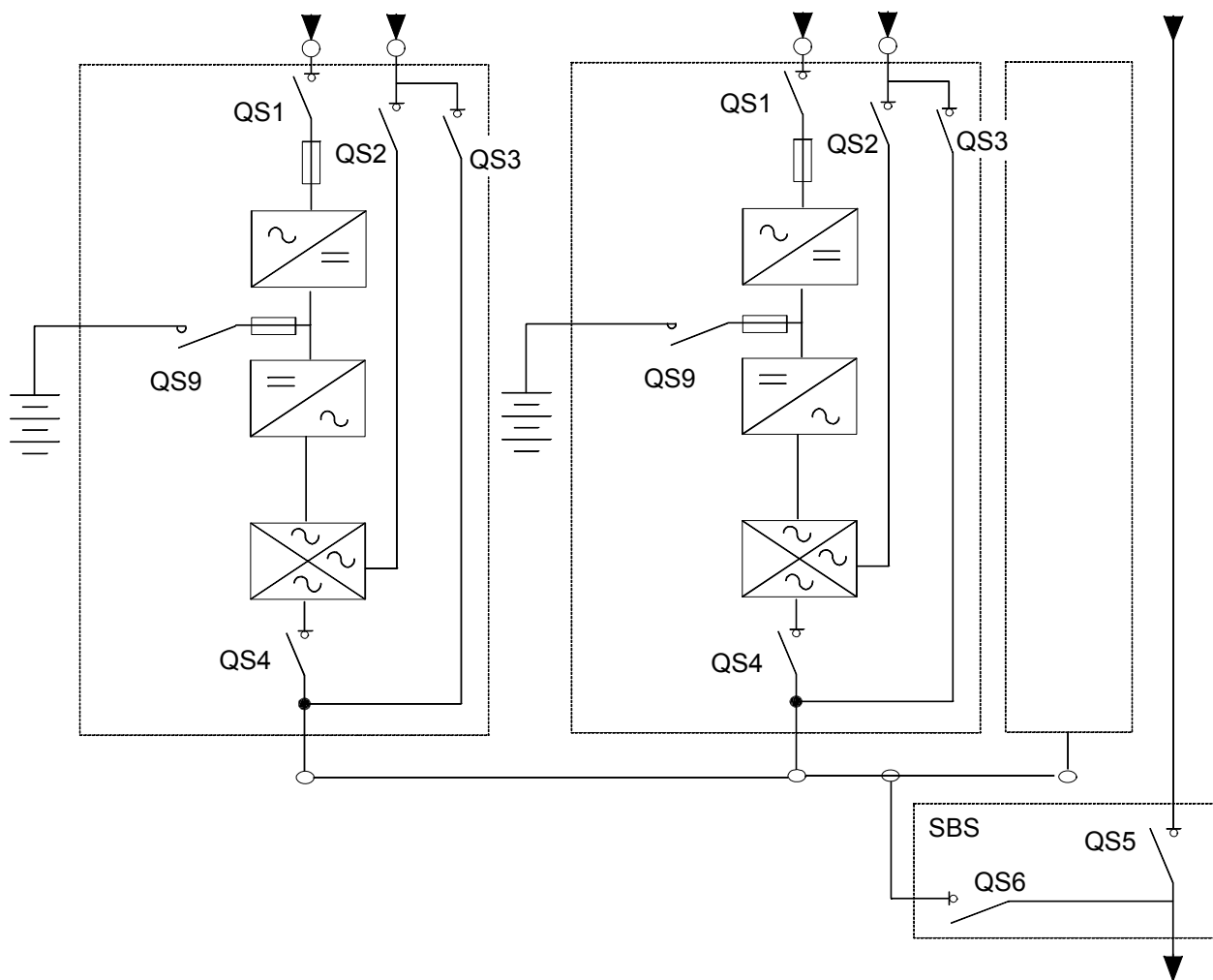
Common Output power connections must be provided by the customer, and must be installed externally to the UPS and COC system.

These diagrams are for reference only, please contact CHLORIDE Technical Support for more information on both signal and power connections.

9.5.9. Parallel COC (centralised) connections with High Fault Clearance connections*Figure 51 - Centralised parallel system electrical connections*

9.5.10. Distributed parallel system electrical connections

Figure 52 - Distributed parallel system electrical connections



N.B.: In distributed parallel systems composed of three or more UPS of 250kVA or greater it is necessary to install the Sytem By-pass Switch (S.B.S.).

N.B.: When installing maintenance switching components downstream of the UPS, do not use automatic devices. Also, we recommend that the microswitch associated with any such device be connected in series with the UPS output switch microswitch so that the UPS can manage the device status.

9.6. Protection devices

The electrical and electronic protections inside the UPS and COC have the single function of protecting the subassemblies and devices inside the units themselves.

For this reason, external devices for protection of cables and loads should be fitted up and down line of the system.

The devices should be circuit breakers or fuses and isolating switches, sized for the currents as indicated below.

The devices should be fitted as close as possible to the supply source, and clearly marked with:

ISOLATE THE UNINTERRUPTIBLE POWER SYSTEM (UPS) PRIOR TO OPERATIONS ON THIS CIRCUIT

9.6.1. Protections on Mains input:

These should be capable of protecting the primary AC mains supply system up-line of the UPS, and should take into account the maximum current drain of each UPS as shown in the tables on pages 40 and 41.

9.6.2. Protections on Reserve input:

These should be capable of protecting the reserve supply, taking into account the maximum power requirements as follows:

10 In for 5 cycles
7 In for 30 cycles
1.5 In for 1 minute
1.25 In for 10 minutes,
where:

$$I_n = \frac{P_n}{\sqrt{3} V_n}$$

P_n = rated power at output [kVA]

V_n = rated voltage at output [V]

A differential device installed on the input reserve supply senses the sum of all earth leakage currents in both the UPS and the installation it supplies.

To avoid spurious operation, the following must be taken into consideration when selecting differential protection devices for installation on input lines:

- (1) Have a nominal value of I_{Δ} which takes in account of the earth leakage current, in normal operating conditions, of the UPS and the installation it supplies: $I_{\Delta} = I_{\Delta UPS} + \text{installation earth leakage current}$. In standard configuration $I_{\Delta UPS}$ varies from 0.3 to 1.0A, according to the rating of the UPS;
N.B. The maximum limit for earth leakage current for a UPS is 5% of the nominal input current (see EN62040-1-1, par. 4.5.12)
- (2) Be of a delayed operation type (greater than 300ms);
- (3) The type of differential switch used must conform to product regulation EN 62040-1-1 Art. 4.5.12
 - In the case of parallel distributed systems a single differential protection device shall be fitted upstream of the point at which the line divides to supply the reserve inputs of the UPS. Installation of separate devices in divers configurations can result in spurious operation.
 - In order to guarantee correct current distribution in the two neutral cables, installation personnel shall ensure that their lengths be as equal as possible.
 - If, however, the reserve lines are drawn from sources that are galvanically isolated from each other, a differential protection device may be installed on each line.

N.B. In this case, and in cases when the load is supplied from the Reserve via the Reserve Static Switch, the isolated sources are connected in parallel. It should be evaluated, on an individual basis, whether any resultant imbalance between the currents on the Reserve lines is compatible with the respective protection devices.

9.6.3. Protections on battery input:

(Required only if batteries are not fitted in cubicles beside the UPS cubicle)

These should be capable of protecting the battery against short-circuits, and should take into account the maximum power drain (in discharging 1.8V for cells), shown in the table on page 34. These devices should be fitted as close as possible to the battery.

9.6.4. Protections on Output line:

As load(s) can be supplied through the Uninterruptible Power System from three sources, the protection system on the output line should take into account the ratings of the following supplies:

(1) supply from UPS:

2 In for 10 milliseconds,
1.5 In for 1 minute
1.25 In for 10 minutes,

(2) supply from reserve static switch:

10 In for 5 cycles
7 In for 30 cycles
1.5 In for 1 minutes
1.25 In for 10 minutes,

(3) supply through by-pass switch:

In this state, the reserve input is directly connected to the output terminals, maximum current equals reserve supply short-circuit current.

Protection should be rated for this short-circuit current and be able to operate in less than 10 milliseconds at a current equal to 2 In.



If a single differential breaker is installed upstream of the UPS, any fault in the installation earthing system will result in the interruption of power to both the mains input and the direct line.

10. OPERATION

10.1 Control Panel and display

The control panel serves as the UPS user interface. An LCD informs the user about the operating status of the UPS.

A single-line diagram of the UPS is continuously displayed on the default page. The main functional blocks and power paths of the UPS are displayed using simple universal technical symbols, instantly communicating the overall status of the UPS. The same screen also permanently displays the output load percentage measurement, using three histograms (one for each output phase). When the UPS is not in normal operating mode, it is possible to access the "Warning and Alarm" summary page directly from the default page. Warnings and alarms are identified by text strings and codes. In battery operation, the display switches between warning code and estimated backup time (minutes).

After 30 seconds of inactivity (i.e. without buttons being pressed) the display reverts to the default page.

The text displayed by the LCD is available in English, Italian, French, German, Spanish Portuguese, Turkish and Chinese, selectable by the user.

See the tables on the following pages for an overview of the Display Message Structure.

Modifications and settings as shown below in menus 21/22/23 may only be carried out by appropriately qualified technicians. Settings should be tested only if the loads supplied by the UPS are non-critical.

10.1.1 Operating procedures

- **Start Inverter**

Press the Inverter ON  button for two seconds

- **Stop Inverter**

Press the Inverter OFF  button for two seconds, an audible alarm will sound during this delay period.

The UPS can be manually switched between bypass and on-line operation using the keys "Inverter ON" (I) and "Inverter OFF" (O).

- **Silencing Buzzer**

To silence the Buzzer press the Reset button momentarily

- **Reset button**

In order to restore normal operation of the UPS following a fault condition, after having corrected the situation causing the fault, press the Reset button for at least one second.

The RESET button also serves as a function control for the control panel LEDs. All LEDs on the control panel illuminate for approx. 1.5 s after pressing the button in normal operation (no warning or fault indicators present), followed by the last five warning indicators appearing one after the other in the two-digit display. If a fault occurs, pressing the button mutes the audible signal and, once the fault has been corrected, pressing the button brings the UPS into operation again.

- **General Status LED**

Three LED indicators provide a quick, general understanding of the status of the UPS, as described below:

OK LED (green)	Normal Operation When this light is on (not flashing), the system is running normally and neither warnings nor alarms are present. During mains failures (all other conditions at being nominal level), this LED will flash.
Warning LED (yellow)	Warning Condition(s) present This indication shall be activated by the presence of anomalous conditions, which could affect the nominal functioning of the UPS. These conditions are not originated with the UPS, but may be caused either by the surrounding environment or by the electrical installation (mains side and load side). It shall be possible to read the description of the active warning(s) by browsing the relevant LCD display menus.
Alarm LED (red)	Alarm Condition When this light is on, immediate attention should be given to the severity of the alarm, and service should be called promptly. It shall be possible to read the description of the active alarm(s) by browsing the relevant LCD display menus.

10.2. Inverter STOP/START procedures

In the course of operating the UPS, it may become necessary, for example in an emergency situation, to switch off the Inverter, this is done by pressing the Inverter Stop button (see Fig. 53 - on page 85) and observing the following procedures:

10.2.1. Single UPS - Reserve normal

In this condition, press, and hold, the Inverter Stop button, for the first two seconds the buzzer sounds (tone #1 - continuous "beep"), if the button is released during this period the operation of the UPS is not affected and the Inverter remains on. After two seconds, the buzzer stops, and an warning message is indicated (warning and fault messages may be viewed by scrolling through the Display Menus as described in "Controls and messages" on page 86):

INVERTER INVERTER OFF

at which point the Inverter is switched off, the load is supplied by the Reserve and the Inverter Stop button can be released

10.2.2. Parallel UPS - Normal operation - Stop inverter

To switch off the Inverters of the UPS in a parallel system, press, and hold, the Inverter Stop button on each UPS control panel, one by one, the buzzer sounds (tone #1 - continuous "beep"), then, after two seconds, the message:

UPS xxxkVA STOP IN STANDBY

may be viewed (see "Controls and messages" on page 86), and the buzzer is silenced, while the Inverter continues to supply the load

Once the last Inverter Stop button has been pressed for two seconds, all the Inverters in the system switch off and the Load is transferred to the Reserve supply.

Until all the Inverters have switched off and the Load is transferred to the Reserve, the "STOP IN STANDBY" command may be reset on any, or all, of the UPS, by pressing the Inverter Start button on the control panel for a minimum of two seconds.

Refer also to para 10.1. on page 83

10.2.3. Parallel UPS - Start Inverter

To switch ON the Inverters of the UPS in a parallel system, press, and hold, the Inverter Start button on each UPS control panel, one by one, after two seconds, the message:

UPS xxxkVA START IN STANDBY
--

may be viewed (see "Controls and messages" on page 86).

Once the last Inverter Start button has been pressed, all the Inverters in the system switch ON and the Load is supplied from the Inverters.

Until all the Inverters have switched ON the "START IN STANDBY" command may be reset on any, or all, of the UPS by pressing and holding the Inverter Stop button on the control panel for a minimum of two seconds.

Refer also to para 10.1. on page 83

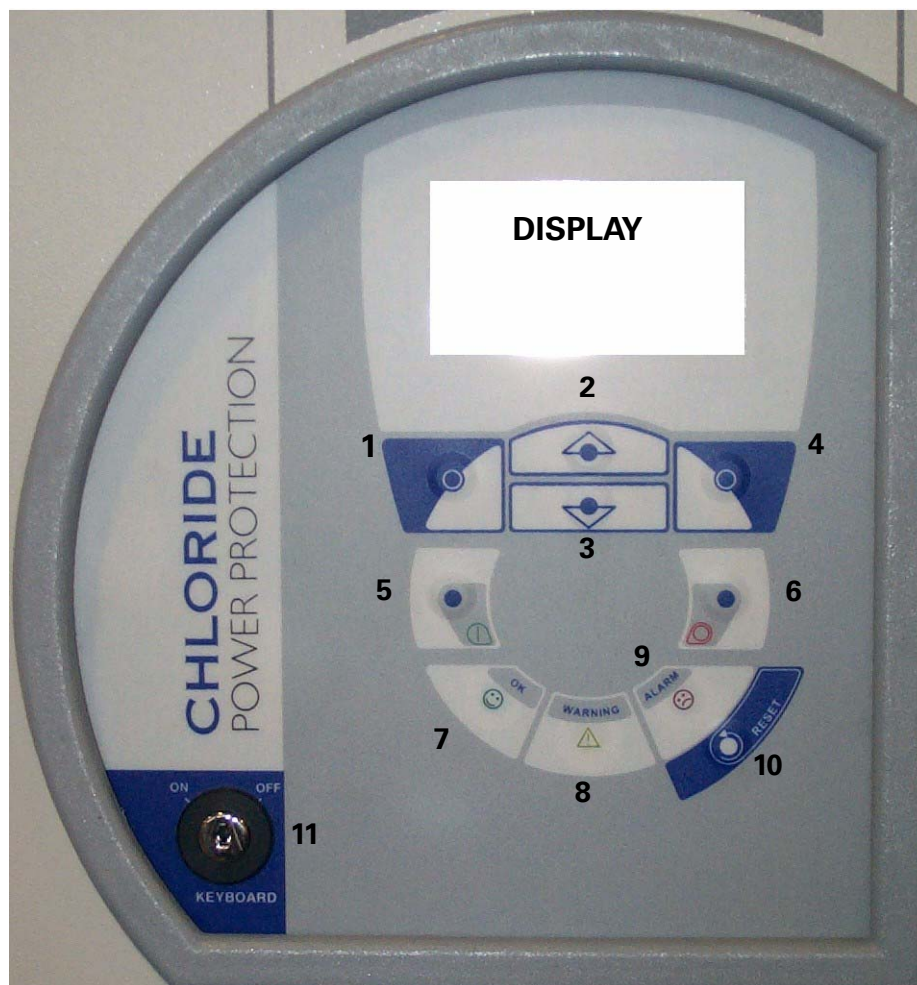


Figure 53 - Control Panel

LEGEND

1	Navigation button - Left soft key	2	Navigation button - Up
3	Navigation button - Down	4	Navigation button - Right soft key
5	Inverter "ON" push button	6	Inverter "OFF" push button
7	System Normal LED	8	Warning LED
9	Alarm LED	10	Reset push button
11	Command keyboard lock		

- **Keyboard lock**

The mimic panel is equipped with a front panel key (11) that disables all the mimic panel commands when the lock is set to "OFF".

In this state, if the operator attempts to perform any of the following actions, the message "COMMANDS DISABLED" appears in the LCD:

*Start Inverter
Set/reset Battery Test
Test PFC
LIFE Manual Call*

*Stop Inverter
Set/reset Autonomy Test
Set/reset Service Input
Reset Delay Call*

*Reset Fault
Set/reset Boost Charge
Set/reset I/O Configuration*

10.3. Controls and messages

The display provides the following structure of windows. Each window has an dedicated number (see figure). By pressing the keys „menu up“ or „menu down“ a walk through the windows can be made.

If it is necessary to modify the settings in menus 31/32/33 the UPS must be switched to Automatic Bypass.

Figure 54 - System block, main- and submenus

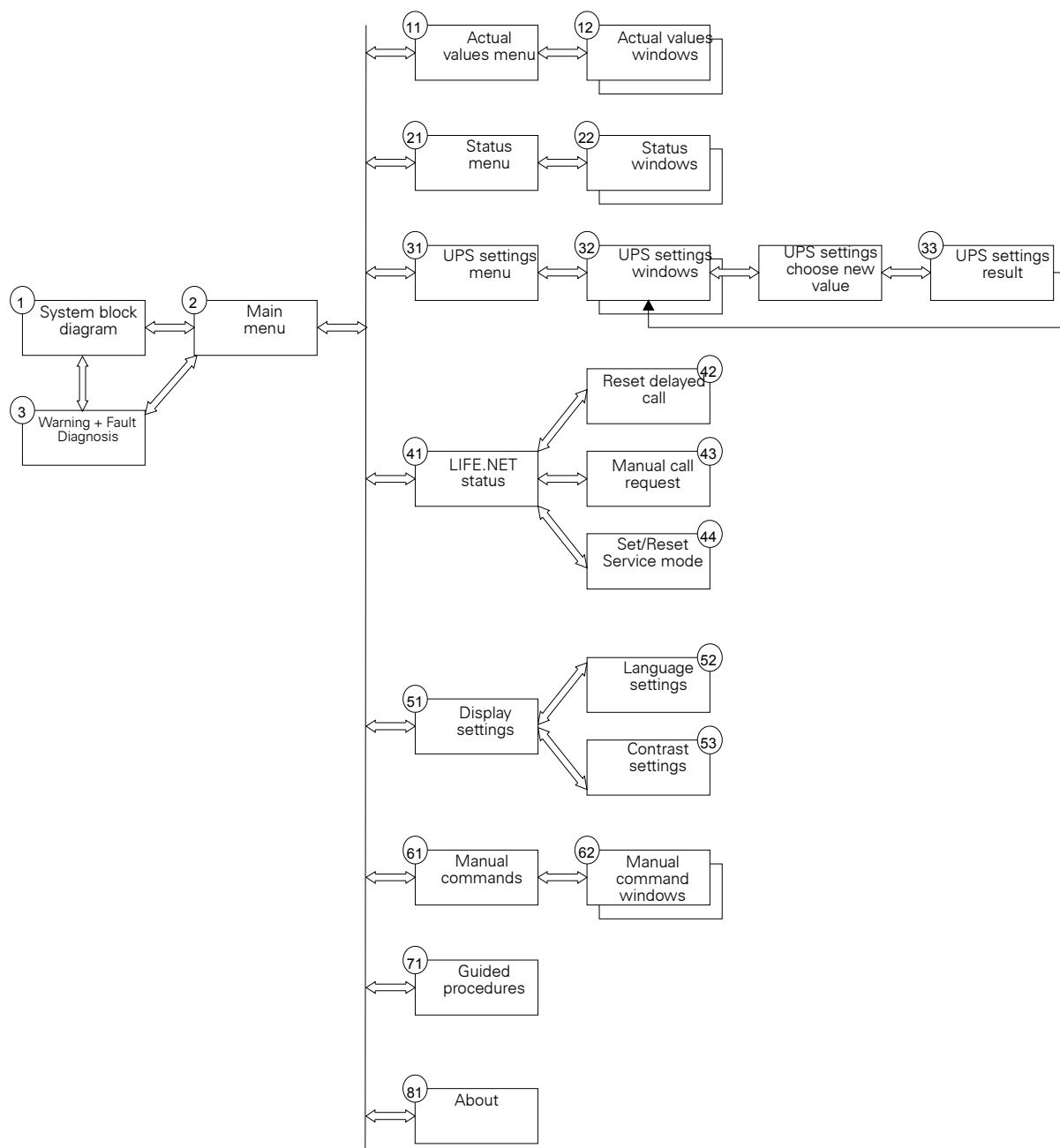


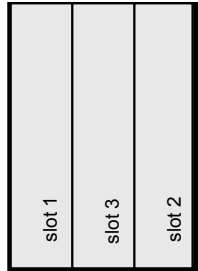
Table 7: Displayed Text - System Block and Main Menu

N°.	Description
1 - SYSTEM STATUS	"Load"
	"Back-up: .. in minutes"
	Presentation of "System Block Diagram"
2 - MAIN MENU	"Actual Values"
	"Status menu"
	"UPS Settings"
	"LIFE"
	"Display Settings"
	"Manual commands"
	"Guided Procedures"
	"About"
3 - WARNING/ FAULT DIAGNOSIS	For information on Warning and Fault messages, refer to para 10.4 "Warning and Fault indications"

Table 8: Displayed Text - Sub Menus

N°.	Description	
11 - ACTUAL VALUES MENU	UPS Input	UPS Output
	DC Link	Battery
12 - ACTUAL VALUES WINDOWS	V Mains L1	Out real power
	V Mains L2	Out real power L1
	V Mains L3	Out real power L2
	Mains Frequency	Out real power L3
	DC current	Out app. power
	V interm. circ.	Out app. power L1
	V Output L1	Out app. power L2
	V Output L2	Out app. power L3
	V Output L3	Overload Threshold
	Frequency output	Load %
12 - ACTUAL VALUES WINDOWS	I Output L1	V Batt.
	I Output L2	T Batt.
	I Output L3	Batt. Current
	Air Temp.	Actual Capacity
		Hold up Time

Table 8: Displayed Text - Sub Menus

N°.	Description	
21 - STATUS MENUS	SYNCHRONISATION*	INVERTER
	RECTIFIER	RESERVE
	BATTERY	LOAD
22 - STATUS WINDOWS	SYNCHRONISATION*	
	SYNCHRON. ACTIVE	SYNCHRON. INACTIVE
	INVERTER	
	INVERTER RUNNING	INVERTER TURNING ON
	INVERTER TURNING OFF	INVERTER NOT RUNNING
	RECTIFIER	
	CHARGER OFF	RECTIFIER HW TEST
	FLOAT CHARGE	BOOST CHARGE
	RECT. EQUALISE MODE	RECHARGE INHIBIT
	BATTERY TEST	BATT. AUTONOMY TEST
	RECTIFIER PHASE UP	RECTIFIER PFC MODE
	RESERVE	
	RESERVE VALID	RESERVE NOT VALID
	BATTERY	
	BATTERY CONNECTED	BATT. DISCONNECTED
	LOAD	
	LOAD ON RESERVE	LOAD ON INVERTER
	LOAD ON BYPASS	LOAD NOT SUPPLIED
31 - UPS SETTING MENU	Input Contact	 slot 1 slot 3 slot 2 Communication box (CU4/POB/Profibus)
	Output Contact	
	Optional Boards (comms. box slot numbers - see right)	
	Other	

* Only if the External Synchronisation Option is activated (see Manual 10H52160PUMC)

Table 8: Displayed Text - Sub Menus

N°.	Description	
32 - UPS SETTINGS MENU	Input Contacts	Function AK3
	Function EK1	On Delay AK3
	On Delay EK1	Off Delay AK3
	Off Delay EK1	Negate Output AK3
	Negate Input EK1	Function AK4
	Output Contacts	On Delay AK4
	Function AK1	Off Delay AK4
	On Delay AK1	Negate Output AK4
	Off Delay AK1	Optional boards
	Negate Output AK1	Board in slot 3
	Function AK2	Profibus Bus Addr.
	On Delay AK2	Profibus PZD5
	Off Delay AK2	Profibus PZD7, PZD8
	Negate Output AK2	Profibus PZD9
33 - SETTING VALUE AND RESET	Parameter cannot be changed, verify if UPS has to be in Bypass Mode	
41 - LIFE MENU (Window: LIFE Status)	LIFE not Active on this UPS	Wait Connection
	Next Call Date	Connected
	Next Call Time	Send LIFE Data
	Delayed call In (> Window 42)	Send Easy Data
	Connection Status	PPVIS Connection
	Call Type (> Windows 43)	Close in Progress
41 - LIFE MENU (LIFE status window)	Service Mode (> Window 44)	Call Rescheduled
	UPS not Connected	
42 - LIFE DELAYED	Reset Delayed Call?	
43 - LIFE MANUAL	Perform a Manual Call	
44 - LIFE SERVICE	Enter Service	Exit Service
51 - DISPLAY SETTINGS	Language	Contrast
52 - LANGUAGE SETTINGS	English/Deutsch/Français/Italiano/Spanish/Portuguese/Chinese	
53 - CONTRAST SETTINGS	Contrast: Up or Down	

Table 8: Displayed Text - Sub Menus

N°.	Description	
61 - MANUAL COMMANDS	BATTERY TEST	AUTONOMY TEST
	BOOST CHARGE	TEST PFC
62 - MANUAL COMMAND WINDOWS	BATTERY TEST	
	START	STOP
	AUTONOMY TEST	
	START	STOP
	BOOST CHARGE	
	START	STOP
	TEST PFC	
	START	
71 - GUIDED PROCEDURES	SINGLE UPS	
	Manual Bypass	Return from Bypass
	Start Up	Shut Down
	DISTRIBUTED PARALLEL	
	Manual Bypass	Return from Bypass
	System Start Up	System Shut Down
	CENTRALISED PARALLEL*	
	COC	UPS
	Manual Bypass	UPS Start Up
	Return from Bypass	UPS Shut Down
	Start Up	
	Shut Down	
81 - ABOUT	Manufacturer	LCD Firmware Date
	Type of UPS	CU Firmware Part N°.
	Website	CU Firmware Rev.
	LCD Firmware Part N°.	CU Firmware Date
	LCD Firmware Rev.	

* In the case of Centralised Parallel systems, the COC is equipped with a non-graphical LCD, therefore only the UPS procedures have been implemented. The COC procedures are described in "Centralised parallel system" on page 112.

10.4. Warning and Fault indications

The UPS recognises and draws attention to a number of events occurring during operation. These events are divided into Warning and Fault indications. Whether the message is a warning or fault can be determined from the number which appears in the Warning/Fault Diagnosis page of the display, and the buzzer signals.

10.4.1 Buzzer

The buzzer has two different patterns, which indicate the type of warning active.

- **Pattern 1: long intervals** - This event is less serious. It is not essential that the cause be rectified immediately, unless otherwise specified in table "Warning indicators".
- **Pattern 2: short intervals** - This is a serious event. The cause should be rectified straight away to avoid a fault condition.

The buzzer is silenced automatically as soon as the cause of the event is rectified. It can also be silenced manually by pressing the button TEST/RESET.

10.4.2. Warning indicators

If a warning indication appears, the UPS continues to operate. The yellow LED ALARM illuminates on the control panel. A number between 1 and 31 appears in the display indicating the type of warning.

10.4.2.1 Displayed Warnings

The various possible warning indications are listed in the following table.

Table 9: Warning indicators

Warning indicator- Buzzer pattern	Cause	Corrective steps
1 - 2	Inverter overtemperature	lower temperature (e.g. with ventilation); if necessary, reduce load; ensure ventilation outlets are unobstructed.
2 - 1	- Reserve switch open - Reserve supply failure	
3 - 1	- Input switch open - Input supply failure	
4 - 2	load too high	reduce load
5 - 2	User DC voltage low	
6 - 1	- 90% kW protection - Peak current limitation - Start of kW protection	reduce load
7 - 2	- Res. phase sequence error - Mains phase sequence error	check phase sequence
8 - 1	- Manual bypass switch closed - System bypass switch closed	
9 - 1	Battery operation	
10 - 2	Shutdown imminent *	switch off load directly
11 - 2	Battery under-voltage **	reduce load
12 - 1	- HW init/Commissioning - Test mode UPS service active - Rectifier HW test	exit operating state after commissioning, initial charging
13 - 1	battery switch open	close battery switch
14 - 1	fan lifetime exceeded	replace fan - call customer service
15 - 1	CU-DCB communication lost	call customer service
16	Internal warning 16	
17	DC SW control fault	

Table 9: Warning indicators

Warning indicator- Buzzer pattern	Cause	Corrective steps
18	- Battery recharging - Recharge inhibit	
19	- Batt. temp. sensor fault - Batt. temp. out of range - Batt. user alarm	
20	- Remote inverter stop - Insufficient ventilation - Remote inverter inhibit - I/O conflict - Inlet temp. sensor fault - Inlet temp. out of range - Inlet temp. user alarm - System output switch open - IIC bus error	
23	DCB memory error	
24	- Rectifier not configured - Mains voltage low - Battery SCR over-temperature	
26	- Stop inverter in stand-by - Start inverter in stand-by	
27	Autonomy test	
28	Transfer inhibit	
29	Synchronisation fault	
31	- DC voltage high - DC voltage low	
32	Output switch open	
*A power failure will only be indicated when the minimum time has been exceeded. **These messages may also appear if battery data have not been correctly entered. Call customer service.		

► Please inform customer service of the indicator number(s) and the illuminated LEDs.

10.4.3. Fault indications

If a fault occurs, the affected UPS component is always switched off, and the UPS automatically switches to the best possible operating mode for supplying the loads; the red FAULT LED illuminates on the control panel. A number between 33 and 84 appears in the Warning/Fault Diagnosis page of the display indicating the type of fault. Fault indicators are also indicated by a continuous tone from the buzzer. If a fault occurs, proceed as follows:

10.4.3.1 Acknowledge horn

First acknowledge the horn by pressing the TEST/RESET button

10.4.3.2 Correct fault

Next correct the fault by following the indications in Table 10 on page 93.

If the fault cannot be corrected:

Call Customer Service: The customer service addresses are given on the last page of this manual.

10.4.3.3 Acknowledge fault

After the fault has been corrected, it must be acknowledged by pressing the TEST/RESET button again.

10.4.3.4. Displayed Faults

The various possible fault indicators are listed in the following table

Table 10: Fault Indications

Fault	Cause	Corrective steps
33	Inverter overtemperature	reduce temperature (e.g. with ventilation); clean or replace filter mats (optional); check load and reduce if necessary; ensure ventilation outlets are unobstructed
34	CU program error	
35	Incorrect power class	
37	Inverter start failed	
39	Inv. DC voltage high	check mains or call customer service (mains voltage too high; voltage peaks in mains; incorrect connection voltage)
40	External quick shutdown	
41	DSP fault	HW defective (CU4) - call customer service
42	Pre-charge fault	HW defective - call customer service
43	Desaturation	
44	overcurrent switch off	check load
46	UPS output out of tolerance	check load or call customer service
47	stop due to overload	check load or call customer service
50	Reserve defect	HW defective (reserve) - call customer service
51	Reserve hardware fault	HW defective (reserve) - call customer service
52	Reserve overload	check load or call customer service
55	CU EEPROM defective	HW defective (EEPROM) - call customer service
57	CU EPROM checksum fault	HW defective (EPROM) - call customer service
58	Inv. temp./res. sensor fault	
59	Optional module	HW defective - call customer service
60	Parallel reserve fault	
61	POB fault	call customer service
62	Output insulation fault	
69	DCB memory error	
70	Rectifier overtemperature	
71	Harmonic input filter	
72	Input insulation fault	
79	Mains sensor fault	
80	DC HW control fault	
81	DC feedback fault	
82	DC SW control fault block	
83	Battery Fault	Battery Test Failed - call customer service
84	Battery SCR fault	Battery Test Failed - call customer service

► Please inform customer service of the indicator number(s) and the illuminated LEDs. Fault indicators not listed in the table can only be corrected by customer service.

10.5. Troubleshooting

10.5.1 Rectification of Errors

If, in spite of the high reliability of this device, problems should occur, please check the following points before contacting the responsible customer service representative:

Is the mains voltage present at the UPS input?

Is the input fuse defective or have circuit breakers tripped?

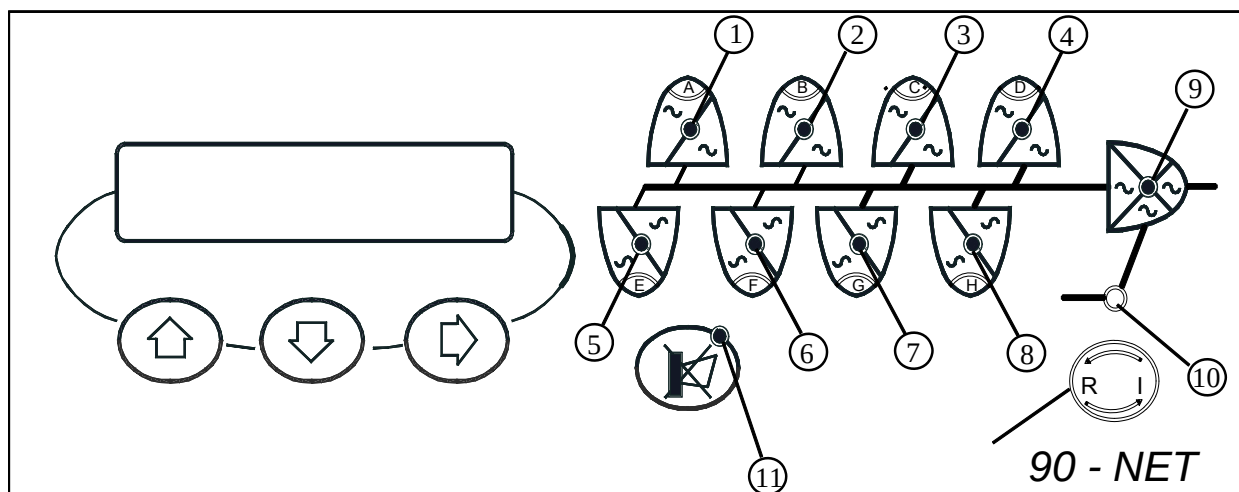
If you contact the responsible customer service representative, please have the following information ready:

- Device information = model, order no., series no. as per nameplate
- An exact description of the problem (what loads are being operated, does the problem occur regularly or sporadically etc.)

Problem	Possible cause	Action
No display No alarm (UPS switched off)	Main switch switched off	Switch on main switch
	No mains voltage present	Have mains inspected by qualified electrician
	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
Green "OK" LED does not illuminate, buzzer sounds at intervals	No mains voltage present	UPS operation
Green "OK" LED does not illuminate when mains voltage present, buzzer sounds at intervals	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
ALARM indicator illuminates, buzzer sounds continuously	UPS error	Contact the appropriate customer service representative
	Overheating	Reduce ambient temperature
Backup time less than that specified	The fuse switch of the battery extension(s) is in "OPEN" position.	Move the fuse switch to the "ON" position.
	Batteries are not completely charged	Charge batteries, and test backup time. If the problem persists, contact the appropriate customer service rep.
	Batteries are defective	Contact customer service
	Charging device is defective	Contact customer service
No communication between UPS and PC	Wrong serial connection cable	Check whether the correct cable has been used (standard modem/null modem cables are not permissible)
	Interface on the PC is being used by another process or is defective.	Check whether other software/service is accessing the interface on the PC; try selecting a different serial interface.
	Interference on the data cable	Lay cable differently.

11. COC CONTROL PANEL

Figure 55 - COC control panel



Display indicators.

(1)	Status indicator UPS A	(off)	(green) - (flashing green)
(2)	Status indicator UPS B	(off)	(green) - (flashing green)
(3)	Status indicator UPS C	(off)	(green) - (flashing green)
(4)	Status indicator UPS D	(off)	(green) - (flashing green)
(5)	Status indicator UPS E	(off)	(green) - (flashing green)
(6)	Status indicator UPS F	(off)	(green) - (flashing green)
(7)	Status indicator UPS G	(off)	(green) - (flashing green)
(8)	Status indicator UPS H	(off)	(green) - (flashing green)
(9)	Status indicator LOAD	(green)	(flashing green)
(10)	Status indicator RESERVE	(green)	(flashing green)
(11)	Alarm indicator	(red)	(flashing red)

LEDs 1 - 8 represent the status of the UPS units connected in parallel. An extinguished LED indicates that the configuration is made up of less than 8 units (e.g. LEDs 7 and 8 extinguished indicate that there are 6 UPS in parallel).

A constant green indicates normal UPS operation, while a flashing LED indicates a warning. LEDs 9 and 10 indicate the status of the LOAD and the RESERVE respectively; a constant green indicates normal operation, while a flashing LED indicates a warning.

LED 11, the alarm indicator, remains extinguished during normal operation, turns red in an alarm situation when the buzzer is activated, and flashes red in an alarm condition when the buzzer is silenced.



load transfer control knob

This knob transfers, or retransfers the Load from the Inverter to the Reserve network, or vice versa, depending on initial conditions.

If the load is on Inverter, press the knob for 2 seconds to activate manual operation; the Load will immediately be transferred to Reserve. If the Load is on Reserve, press the knob for 2 seconds to restore "automatic" operation, and to re-transfer to Inverter after 5 seconds. Transfer will only be effected if the UPS units are in synchronisation with the Reserve network.

N.B.: The Load transfer command to Reserve is a PERMANENT condition; press the Control Knob a second time to return the Load to Inverter.

SYSTEM START-UP

When the system is started up, this control is disabled. To enable it, press the Inverter Start button on each UPS in the parallel system.

11.1. Control panel



Audible alarm cancel switch

Cancels the audible alarm. When pressed, the red warning light starts flashing. The effect of this switch is confined to the 90-NET display control software. No input is sent to the UPS.



Page right control

Moves the page headings displayed on screen to the right. The effect of this switch is confined to the 90-NET display control software. No input is sent to the UPS.



Scroll up

Substitutes the message displayed with the previous one. Scrolling will stop at the top of the page. The effect of this switch is confined to the 90-NET display control software. No input is sent to the UPS.



Scroll down

Substitutes the message displayed with the next. Scrolling will stop at the end of the page. The effect of this switch is confined to the 90-NET display control software. No input is sent to the UPS.

Fault reset

Once the factor causing a fault has been rectified, it is possible to cancel a fault condition and restore the unit to normal operation using the command "RESET FAULT" in the "FUNCTION MENU".

11.2. 90-net diagnostics for parallel system with COC

Diagnostics is subdivided into several sections, each representing a functional element of the UPS (e.g. INVERTER, LOAD). Each block is broken down into 4 pages:

FIRST PAGE, stage page - This PAGE displays the name of the stage (System, Rectifier, Battery, Inverter, Reserve, Load) and its general status.

Press



to access

SECOND PAGE, status page - This PAGE displays the status of each specific stage

Press



to access

THIRD PAGE, alarms page - Stage alarms will be displayed only if at least one alarm is active

Press



to access

FOURTH PAGE, measurements page - All stage measurements are displayed

Use



or



to scroll through the information

The figure on the following page is intended to simplify 90-net.

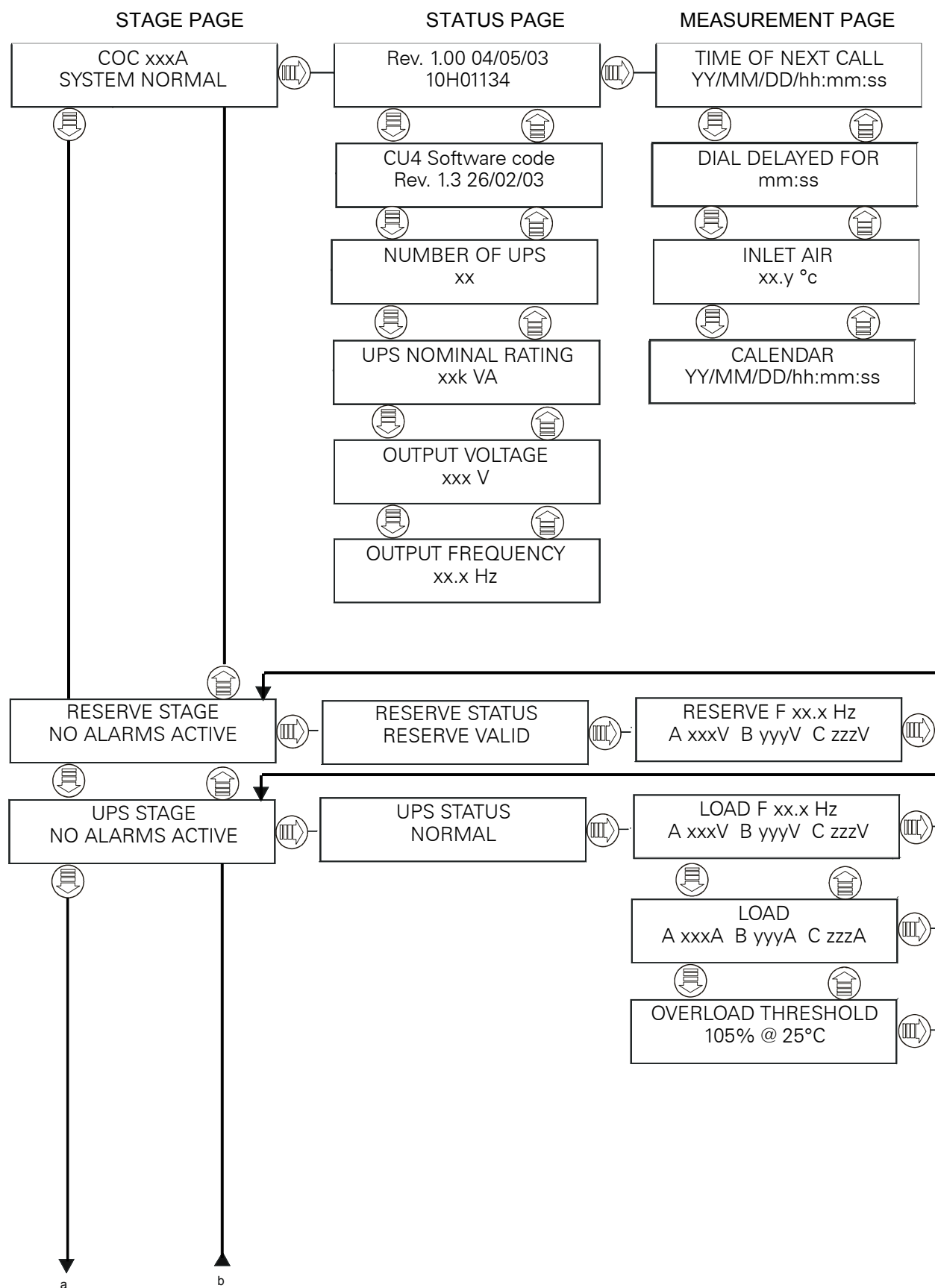
Introduction

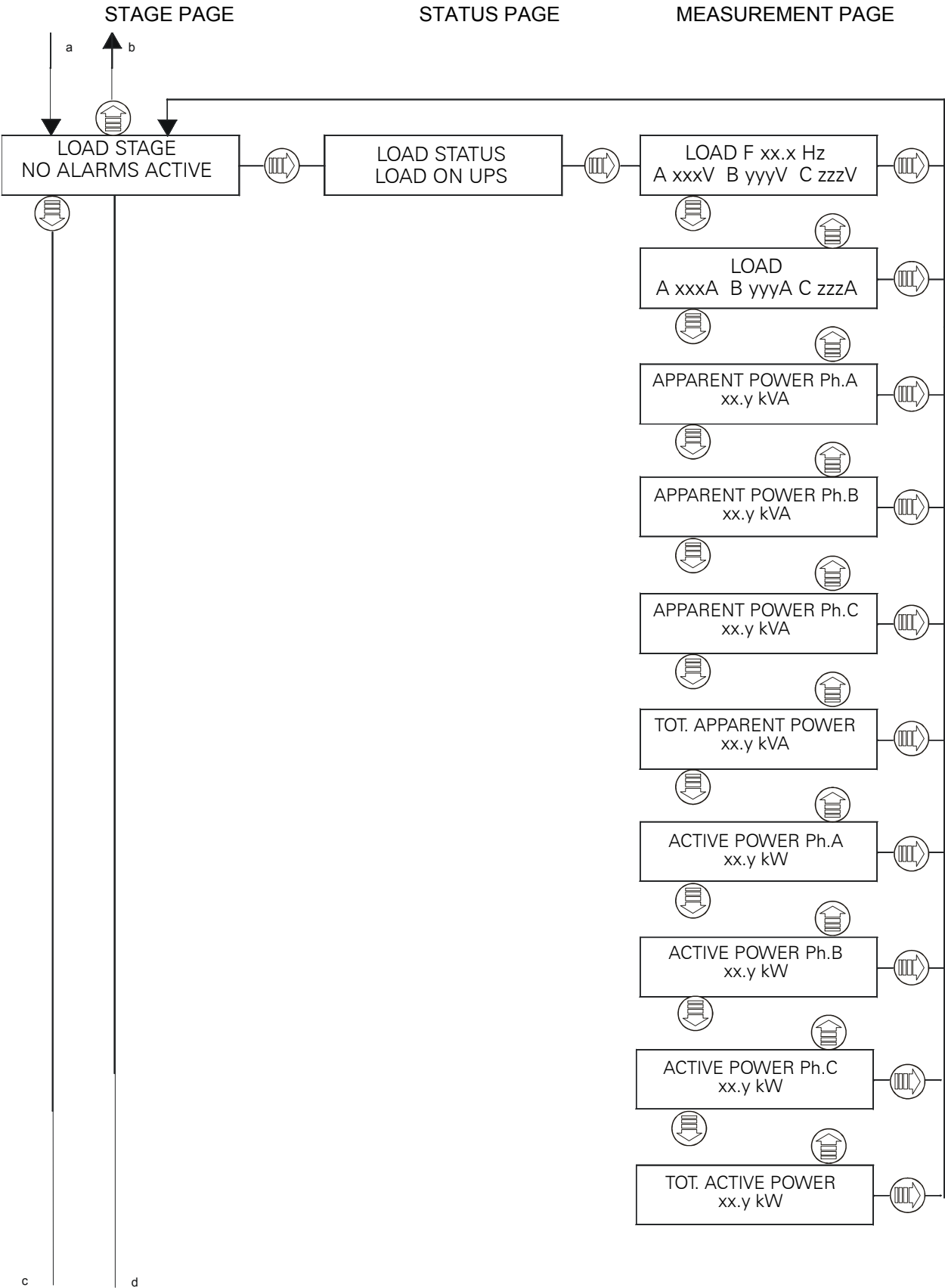
The following pages will illustrate the messages available on the display.

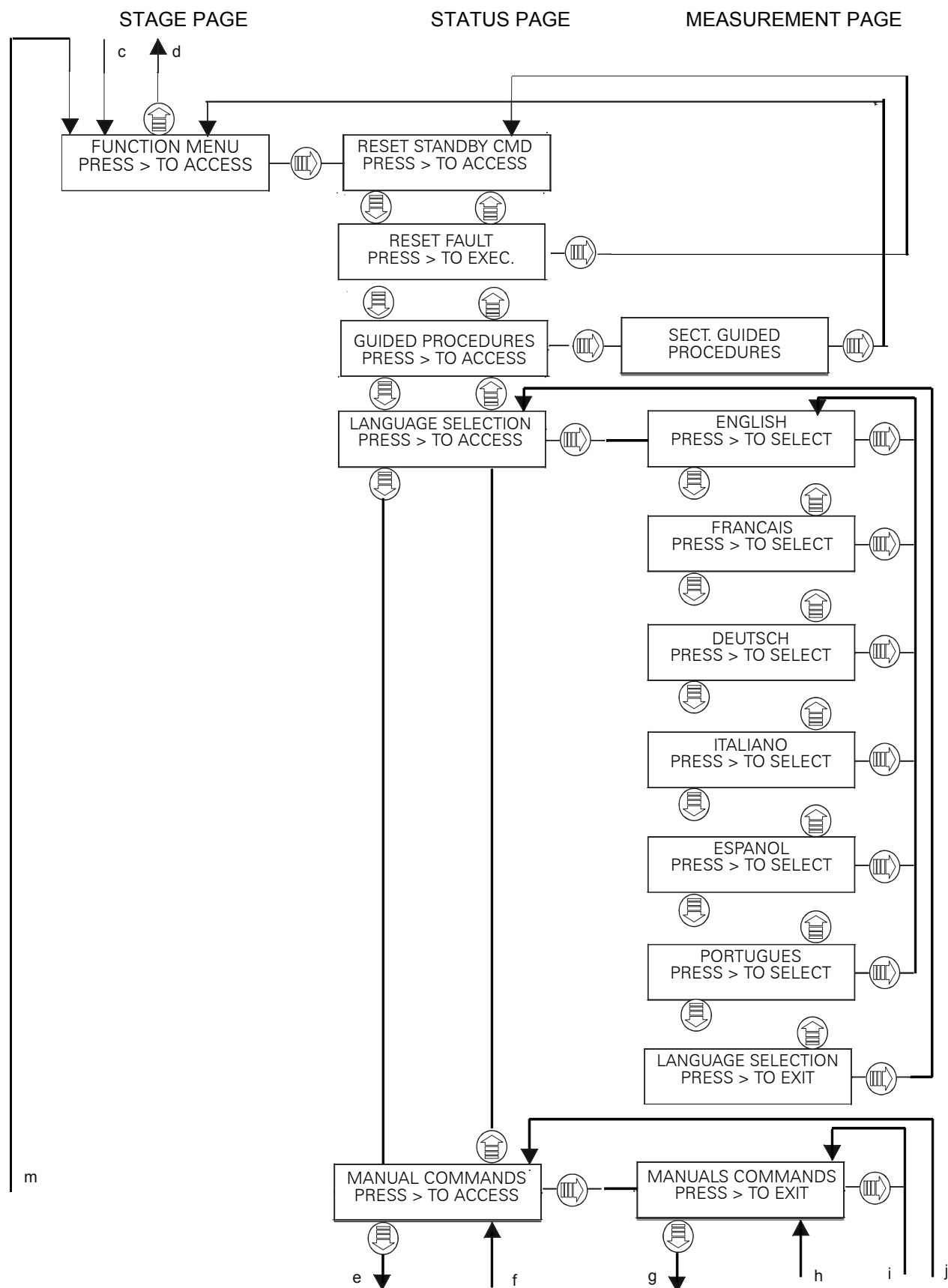


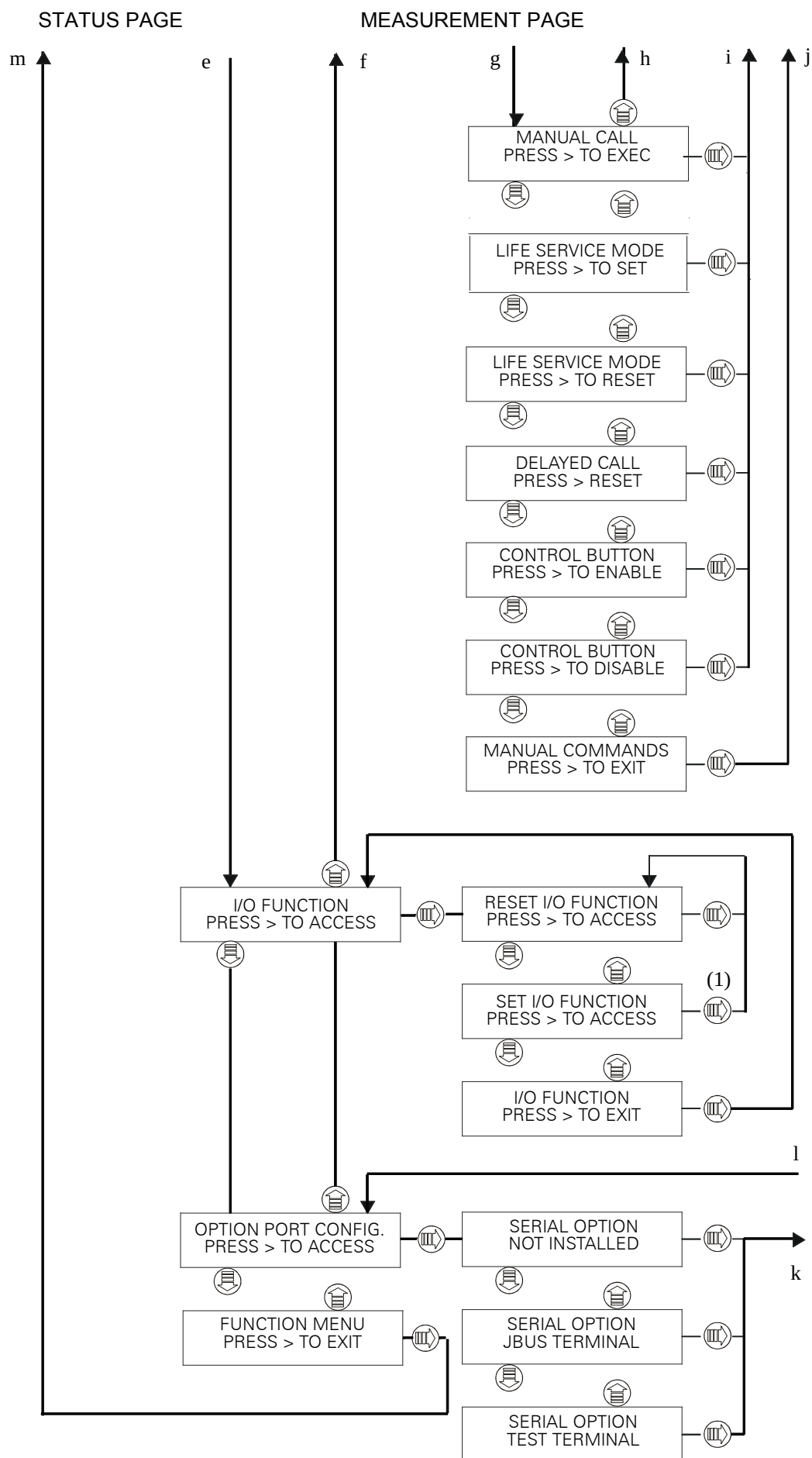
The symbols , and represent the three user pushbuttons below the display (Fig. 55). The line attached to each arrow indicates the new message obtained by pressing the pushbutton.

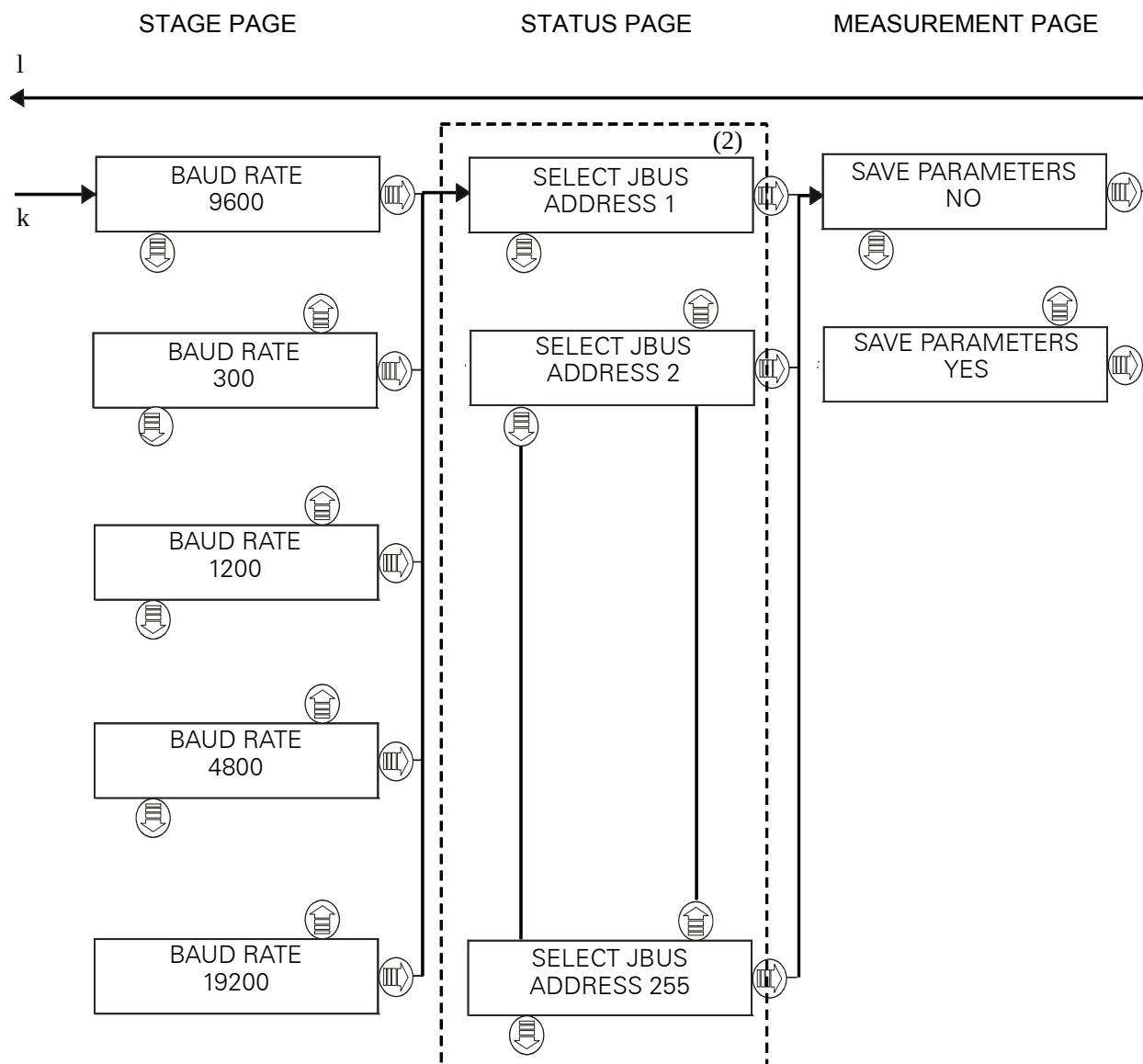
11.3. COC messages normal condition





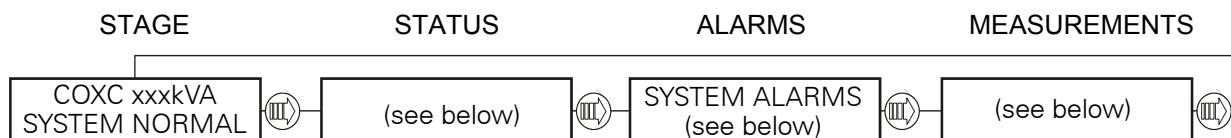






2) Only if JBUS option is selected.

11.4. Description of COC system stages



The following conditions may appear instead of "SYSTEM NORMAL" on the "**SYSTEM**" (first) page:

- SERVICE WARNING
- SYSTEM FAULT
- RES. TRANSF. STANDBY
- UPS TRANSF. STANDBY
- LIFE SERVICE MODE
- COMMAND DISABLED
- E.P.O. ACTIVE

Machine status and other information will be displayed on the "**STATUS**" (second) page:

- UPS SIZE
- NUMBER OF UPS
- NOMINAL VOLTAGE
- NOMINAL FREQUENCY
- HIGH FAULT CLEARANCE ENEABLED
- DIAL IN PROGRESS
- DATA TRANSF. ACTIVE
- SLAVE CONNECTION
- ROUTINE CALL
- MANUAL CALL
- EMERGENCY CALL
- LIFE BUFFER FULL
- RESCHEDULED CALL
- Rev. 1.x xx/xx/xx - Revision of display board software
- Rev. 1.x xx/xx/xx - revision of CU4 software

Any active alarms are displayed on the "**ALARMS**" (third) page. Each message is associated with one of the following conditions:

MESSAGE	CONDITION
GENERAL FAULT	FAULT
CU4 EPROM CHECKSUM FAULT	FAULT
CU4 EEPROM FAULT	FAULT
COC SERVICE ACTIVE	WARNING
VENTILATOR LIFE END	WARNING
COMMISSIONING MODE	WARNING
CU4 COMMUNICATION LOST	WARNING
PARALLEL RES. FAULT	FAULT
POB FAULT	FAULT
IIC 1 EEPROM FAULT	FAULT
IIC 2 EEPROM FAULT	FAULT
IIC BUS ERROR	WARNING
DISPLAY CMOSS FAULT	FAULT
DISPLAY EEPROM FAULT	FAULT
BYPASS SENS. FAULT	FAULT
I/O CONFLICT	WARNING
TEMPERATURE USER ALARM	WARNING
TEMP. OUT OF RANGE	WARNING
TEMP. OUT OF RANGE/FAULT	WARNING
CONFIG. DATA LOST	FAULT
CONTROL BUTTON ENABLED	WARNING

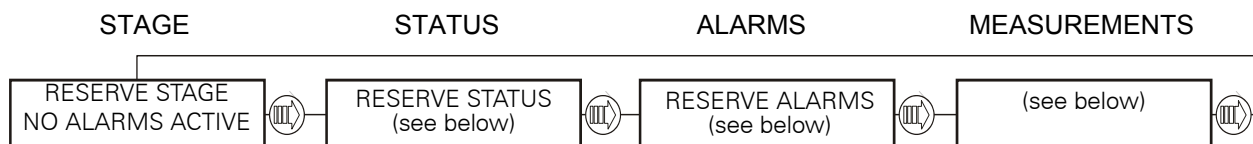
The following measurements appear on the "**MEASUREMENTS**" (fourth) page:

- TIME OF NEXT CALL:
YY-MM-DD hh:mm:ss
- DIAL DELAYED FOR
DD hh:mm:ss
- INLET AIR
Temp: 37°C
- TOTAL MAINS FAILURES

xxx

- MAINS FAILURE TIME
TIME DD : hh : mm : ss
- CALENDAR
YY-MM-DD hh:mm

11.5. COC RESERVE stage description



The following conditions may appear instead of "NO ALARMS ACTIVE," on the "**RESERVE STAGE**" (first) page:

- E.P.O. ACTIVE
- FAULT
- WARNING

Machine status and other information will be displayed on the "**RESERVE STATUS**" (second) page:

- RESERVE VALID
- RESERVE NOT VALID
- CU4 COMMUNIC. LOST

Any active alarms are displayed on the "**ALARMS**" (third) page. Each message is associated with one of the following conditions:

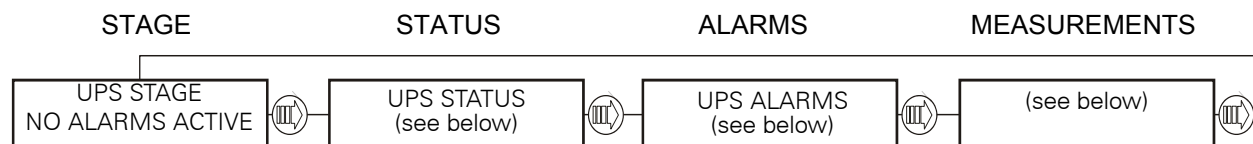
MESSAGE	CONDITION
RES. TRANSF. PROTECT	FAULT
RESERVE BREAKER OPEN	WARNING
BACKFEED PROT ACTIVE	FAULT
OVERLOAD	FAULT
PHASE 1 NOT OK	FAULT
PHASE 2 NOT OK	FAULT
PHASE 3 NOT OK	FAULT
RESERVE SUPPLY FAULT	FAULT
RESERVE HW FAULT	FAULT
PHASE SEQUENCE ERROR	WARNING
RESERVE NOT VALID	WARNING
RESERVE FUSE BLOWN	FAULT
RES. MAINTEN. BRK. OPEN*	WARNING
ALARMS NOT AVAILABLE	WARNING
STATIC SWITCH OVERTEMP	FAULT

* Available only with certain revisions of CU4 and Display software.

The following condition may be displayed on the "**MEASUREMENTS**" (fourth) page.

- RESERVE 50.0Hz
A 230V B 230V C 230V

11.6. COC UPS stage description



The following conditions may appear instead of "NO ALARMS ACTIVE," on the "**UPS STAGE**" (first) page:

- E.P.O. ACTIVE
- WARNING

Machine status and other information will be displayed on the "**UPS STATUS**" (second) page:

- UPS NORMAL
- UPS A WARNING
- UPS B WARNING
- UPS C WARNING
- UPS D WARNING
- UPS E WARNING
- UPS F WARNING
- UPS G WARNING
- UPS H WARNING
- CU4 COMMUNIC. LOST

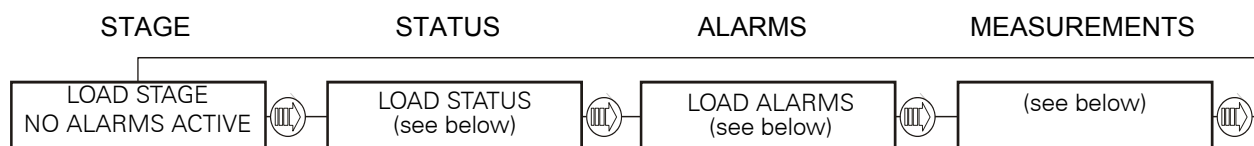
Any active alarms are displayed on the "**ALARMS**" (third) page. Each message is associated with one of the following conditions:

MESSAGE	CONDITION	MESSAGE	CONDITION
UPS A ALARM	WARNING	UPS E ALARM	WARNING
UPS A SHUTDOWN IMM.	WARNING	UPS E SHUTDOWN IMM.	WARNING
UPS A DISCONNECTED	WARNING	UPS E DISCONNECTED	WARNING
UPS B ALARM	WARNING	UPS F ALARM	WARNING
UPS B SHUTDOWN IMM.	WARNING	UPS F SHUTDOWN IMM.	WARNING
UPS B DISCONNECTED	WARNING	UPS F DISCONNECTED	WARNING
UPS C ALARM	WARNING	UPS G ALARM	WARNING
UPS C SHUTDOWN IMM.	WARNING	UPS G SHUTDOWN IMM.	WARNING
UPS C DISCONNECTED	WARNING	UPS G DISCONNECTED	WARNING
UPS D ALARM	WARNING	UPS H ALARM	WARNING
UPS D SHUTDOWN IMM.	WARNING	UPS H SHUTDOWN IMM.	WARNING
UPS D DISCONNECTED	WARNING	UPS H DISCONNECTED	WARNING

The following conditions may be displayed on the "**MEASUREMENTS**" (fourth) page.

- LOAD 50.0Hz
A 235V B 234V C 233V
- LOAD 50.0Hz
A 20A B 23A C 33A
- OVERLOAD THRESHOLD
xxx% (@yy°C)

11.7. LOAD stage description



The following conditions may appear instead of "NO ALARMS ACTIVE," on the "**LOAD STAGE**" (first) page:

- E.P.O. ACTIVE
- FAULT
- WARNING

Machine status and other information will be displayed on the "**LOAD STATUS**" (second) page:

- LOAD ON RESERVE
- LOAD ON UPS
- LOAD ON BYPASS
- LOAD NOT SUPPLIED
- CU4 COMMUNIC. LOST

Any active alarms are displayed on the "**ALARMS**" (third) page. Each message is associated with one of the following conditions:

MESSAGE	CONDITION
INSULATION FAILURE	FAULT
OUTPUT SWITCH OPEN	WARNING
OVERLOAD	WARNING
LOAD TOO HIGH	WARNING
BYPASS SWITCH CLOSED	WARNING
ALARMS NOT AVAILABLE	WARNING
OUTPUT VOLTS HIGH	FAULT
OUTPUT VOLTS LOW	FAULT
OUT. FREQ. ERROR	FAULT
OUTPUT SHORT CIRC.	FAULT

The following condition may be displayed on the "**MEASUREMENTS**" (fourth) page.

- OUTPUT 50.0Hz
A 230V B 230V C 230V
- OUTPUT
A 20A B 23A C 33A
- ACTIVE POWER Ph.A
A 123kW
- ACTIVE POWER Ph.B
B 123kW
- ACTIVE POWER Ph.C
C 123kW
- TOTAL ACTIVE POWER
369kW
- APPARENT POWER Ph.A
A 123kVA
- APPARENT POWER Ph.B
B 123kVA
- APPARENT POWER Ph.C
C 123kVA
- TOTAL APPARENT POWER
369kVA

12. OPERATING PROCEDURES

For the following procedures, assume that the UPS is in one of the following operating modes:

- Switched off: all network and power switches are open. The load is voltage free.
- Service bypass operation: the UPS is switched off, but the load is connected via the service bypass switch supply line to the unprotected mains.
- Normal operation: all relevant mains and power switches are connected. The load is supplied by the UPS.



Notice

Refer to para 10.1. on page 83.



Notice

The acoustic alarm may be activated at various times in this procedure. It can be switched off by pressing the "Test/Reset" pushbutton.



Notice

Warning messages may appear briefly on the display. However, these may be disregarded.

To access the guided procedures select "Guided Procedures" from the display Main Menu (see Table 7 on page 87). The procedures available for the current UPS configuration are displayed. The following table lists the various procedures that can be carried out for each configuration:

Table 11: UPS GUIDED PROCEDURES

Single UPS	Distributed Parallel (with SBS) ^{a)}	Centralised Parallel
		COC ^{b)}
Manual Bypass	Manual Bypass	Manual Bypass
Return from Bypass	Return from Bypass	Return from Bypass
Start Up	System Start Up	Start Up
Shutdown	System Shut Down	Shutdown
		UPS
		UPS Start Up
		UPS Shut Down

a) In parallel systems that include the System Bypass Switch (SBS), configure parameter P578 = 1 on the PPVis "Parallel and Ext. Synch. Configuration" page, and enable the SBS I/O functions (see "Function R for parallel UPS with SBS" on page 134).

b) In the case of Centralised Parallel systems, the COC is equipped with a non-graphical LCD, therefore only the UPS procedures have been implemented. The COC procedures are described in "Centralised parallel system" on page 112.

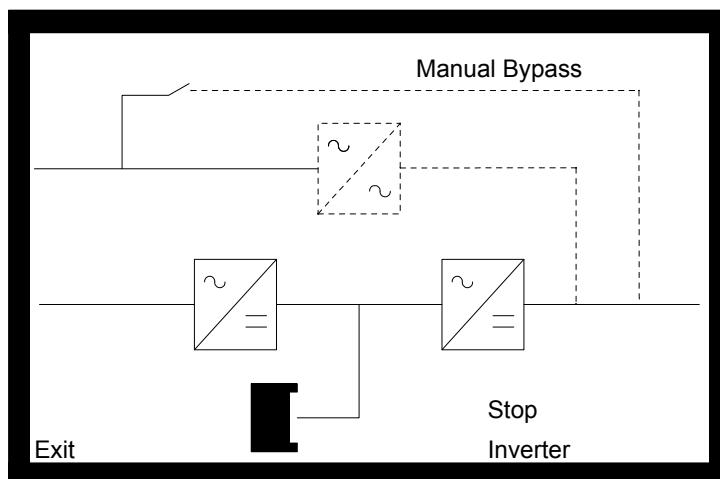
12.1. Sample guided procedure - Manual Bypass



Notice

The BY-PASS switch handle is delivered separately, and must be fitted prior to commencing MANUAL BYPASS procedure and removed when completed.

When the desired procedure has been selected from the Guided Procedures menu (in this case the Single UPS Manual Bypass procedure), the following window appears in the display, illustrating the principle UPS components and their current status:



The various UPS switches are also represented - the Maintenance Bypass switch, QS3, is shown in the open (OFF) position in the above example - these show the current status of the switches, and flash to indicate the user must open, or close, the corresponding switch.

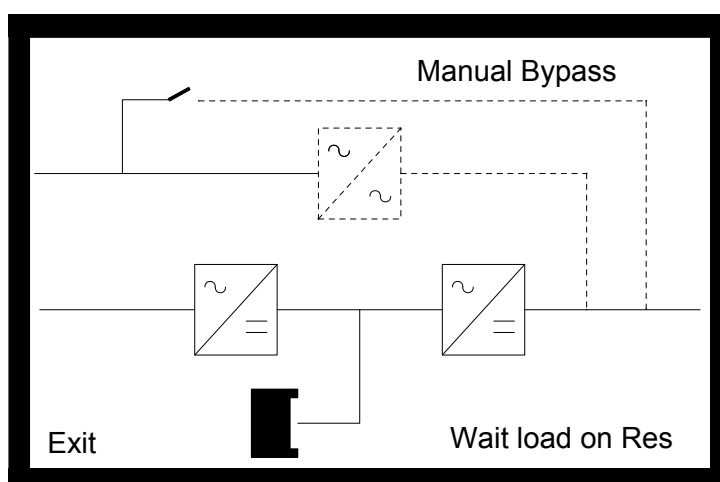
In the event of a fault, a warning message is displayed (see "Warning messages" on page 111 for full list of warning messages), exit the procedure, correct the fault condition and reset before proceeding. Pressing the button identified by the "Exit" message at any moment interrupts the procedure.

In this case, the message "Stop Inverter" appears in the bottom right of the display, and the Stop  symbol flashes over the Inverter, indicating that the user must stop the Inverter by pressing the corresponding button on the "Control Panel" on page 85. (See "Instruction messages" on page 111 for full list of instruction messages).

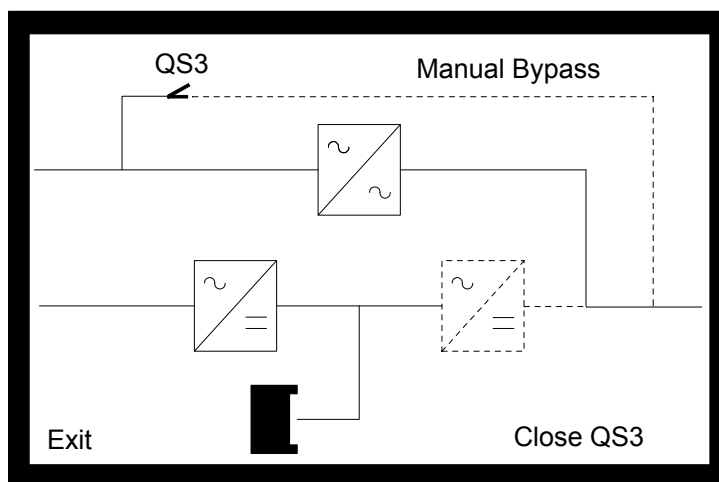
PROCEDURE:



- (1) Press the Stop Inverter button for at least 2 seconds.
- (2) The message "Wait load on Res." is displayed, indicating that the system is waiting for the load to be transferred to the Reserve supply.

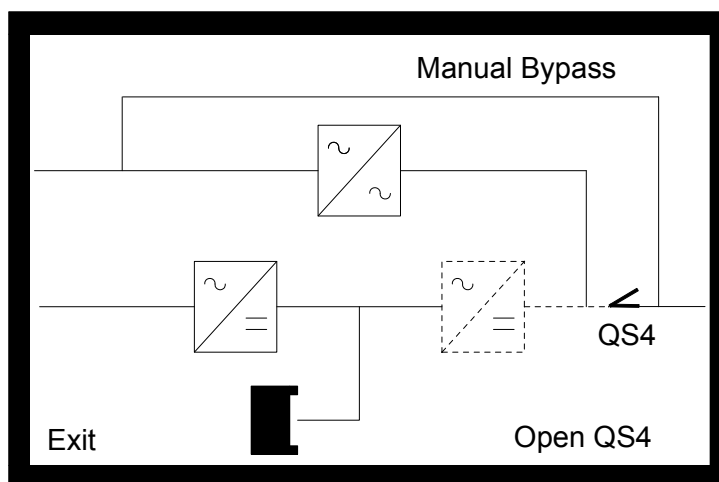


(3) The message "Close QS3" is displayed, and the symbol representing QS3 on the display begins to flash.



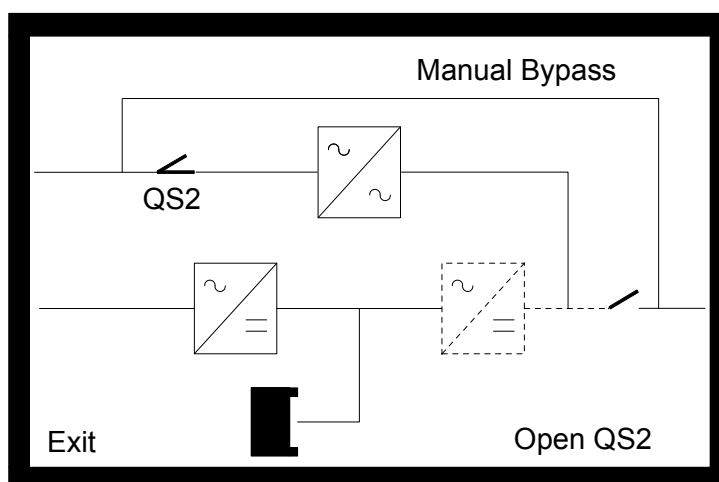
Close QS3 (Maintenance Bypass switch)

(4) The message "Open QS4" is displayed, and the symbol representing QS4 on the display begins to flash.



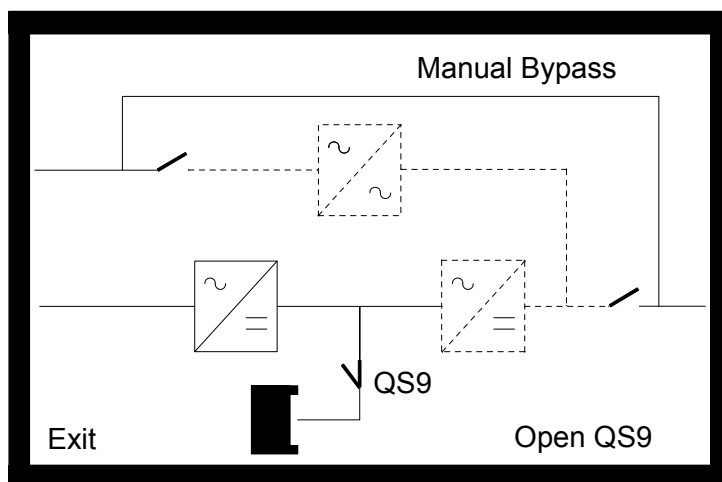
Open QS4 (Output switch).

(5) The message "Open QS2" is displayed, and the symbol representing QS2 on the display begins to flash.



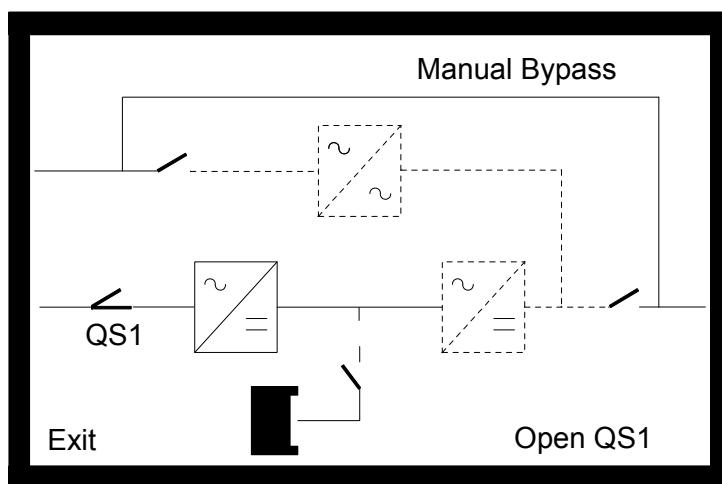
Open QS2 (Bypass switch)

(6) The message "Open QS9" is displayed, and the symbol representing QS9 on the display begins to flash.



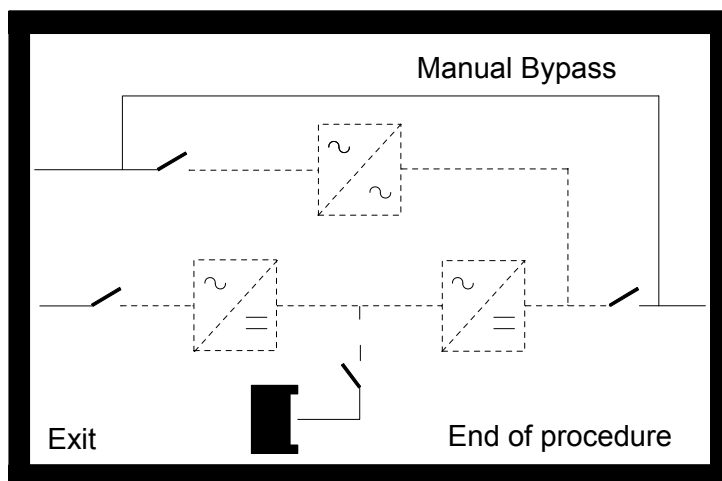
Open QS9 (Battery switch)

(7) The message "Open QS1" is displayed, and the symbol representing QS1 on the display begins to flash.



Open QS1 (Input switch).

(8) The message "End of procedure" is displayed.



12.1.1. Instruction messages

Stop Inverter	Open QS1	Close QS1
Start Inverter	Open QS2	Close QS2
Press Exit	Open QS3	Close QS3
Reset Fault	Open QS4	Close QS4
	Open QS5	Close QS5
	Open QS6	Close QS6
	Open QS9	Close QS9

12.1.2. Warning messages

Procedure not OK
Wait Vdc in range
Waiting Bypass ON
Wait Load on Bypass
Wait Load on Invert.

12.2. Centralised parallel system



Notice
THESE PROCEDURES ARE DISPLAYED ON THE C.O.C. NON-GRAPHICAL DISPLAY

The system can be configured as either centralised parallel (1) or centralised parallel with high fault clearance mode (2); the correct parameter settings for these configurations are:

- (1) PNU 568 = 0 on both UPS and COC; PNU 73 = 2 on UPS and PNU 73 = 1 on COC
- (2) PNU 568 = 0 on both UPS and COC; PNU 73 = 3 on UPS and PNU 73 = 1 on COC

From the COC "GUIDED PROCEDURE" page, press  to access the 4 procedures below:

- MANUAL BYPASS
- RETURN FROM BYPASS (*)
- START UP (*)
- SHUTDOWN

(*) Control logic is not supplied when the UPS is stopped or in by-pass. To follow the guided procedure, either the primary input switch or the reserve input switch must be closed.
If the requested procedure is incompatible with the machine status, the procedure will not be accessed and the following message will appear:

"PROCEDURE NOT OK"

The microprocessor makes sure that each procedure is performed correctly, giving step-by-step instructions to the operator for the manual operations required.
When an operation has been executed or a required condition has been verified, the message relating to the next step is displayed until the procedure has been completed.
If a required operation is not executed or a condition is not verified, a message will be displayed showing the status that temporarily or permanently prevents the procedure from being completed.

If the procedure has been successfully completed, the following message will be displayed.

"PROCEDURE COMPLETE"

Press  to exit the procedure at any time

The maximum number of messages that can be displayed is listed on the following pages.
Each message may contain an operation request or an indication. Each message is flanked by the type of message (operation or indication) and the description.



Notice
If the current procedure cannot be completed due to permanent alarms or blocking conditions, the operator (depending on level of personal training) must:

- call Back-up assistance;

or

- follow the instructions given in the "Troubleshooting" section of the Technical Manual

Symbols

MANUAL BYPASS
PRESS > TO ACCESS

= example of display message



= example of control panel pushbutton

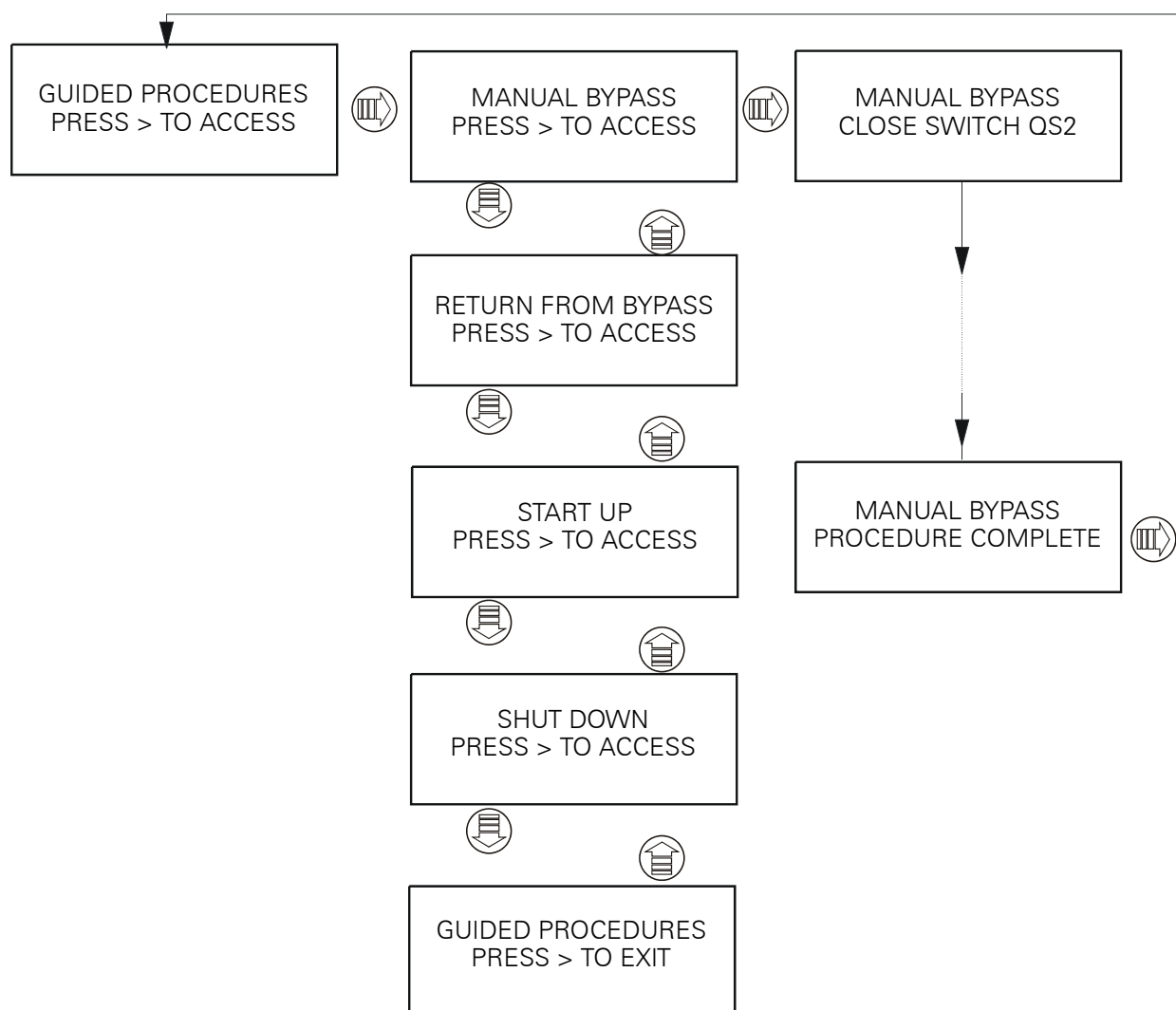
12.2.1 Procedure selection

The following messages relate to the 4 COC procedures available for selection. The pushbuttons to access and scroll each procedure on the COC Control Panel are also illustrated.

Press  to access a procedure; if the machine status permits the operation, the first message will be displayed.

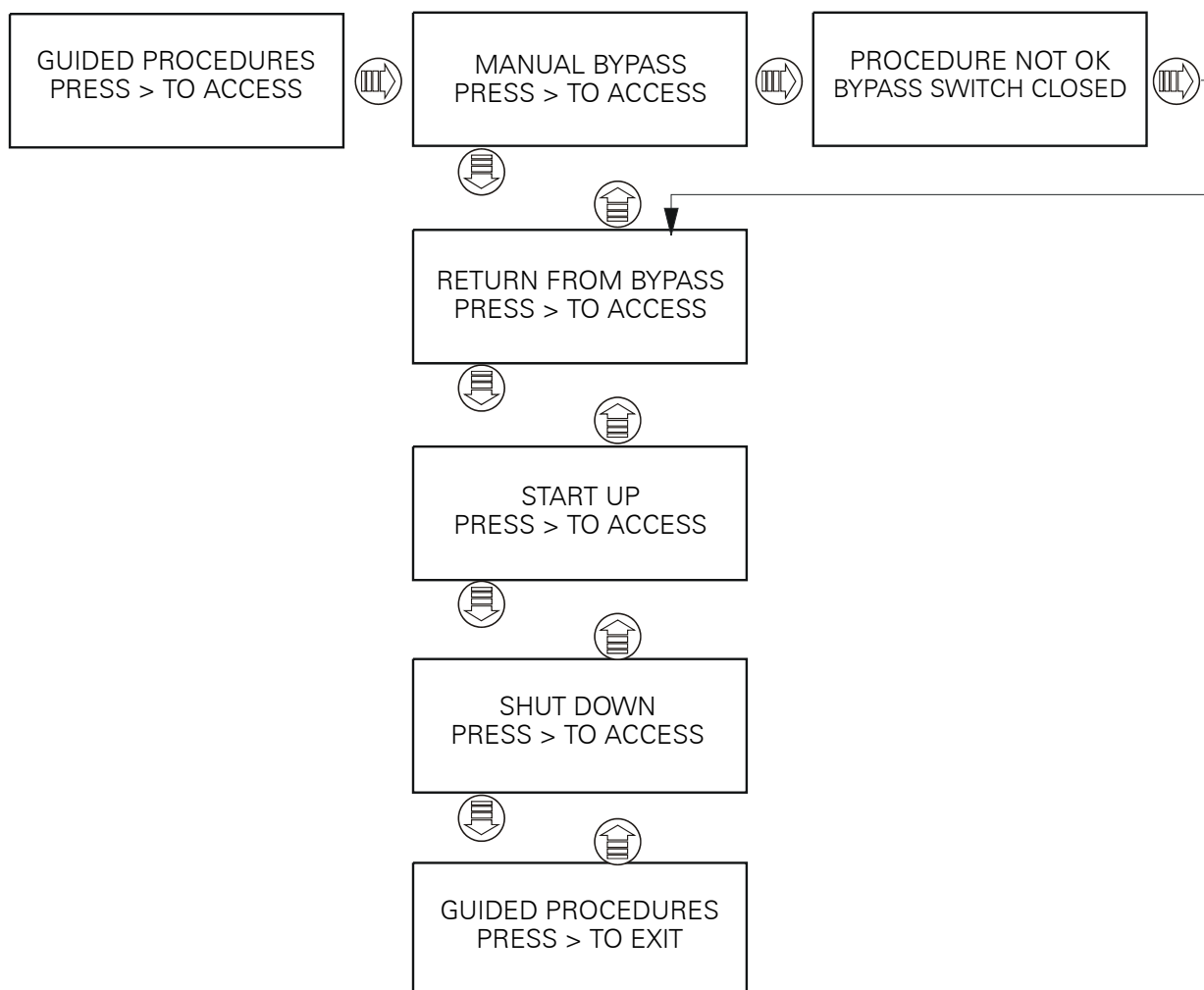
Once the procedure has been completed, press  to return to the "GUIDED PROCEDURE"

page. The diagram below represents the "MANUAL BYPASS" procedure.



Press  to access a procedure; if the machine status does not permit the operation, the message "PROCEDURE NOT OK" appears in the machine status message.

Press  once again to move on to the next procedure. The diagram below illustrates a manual bypass request when the UPS is already in the bypass condition.



12.2.2. System procedures (COC)**12.2.2.1 System START UP procedure**

MESSAGE NAME	MESSAGE TYPE	INFO
START UP RESET FAULT	Request for intervention	System FAULT, reset before proceeding
START UP EPO ACTIVE	Indication	Procedure not possible while EPO is active
START UP OPEN QS3 SWITCH	Request for intervention	Open Bypass switch QS3
START UP CLOSE QS2 SWITCH	Request for intervention	Close Reserve switch QS2
START UP CLOSE QS4 SWITCH	Request for intervention	Close output switch QS4
START UP ON UPS THEN PRESS BUZZER	Request for intervention	Perform parallel UPS start up procedure and press  to proceed
START UP WAIT LOAD ON RESERVE	Indication	System is awaiting load on Reserve
START UP TRANSFER LOAD TO UPS	Request for intervention	Transfer load to Inverter by pressing 
CHECK UPS FAULT THEN PRESS BUZZER	Request for intervention	Check if any FAULTS are active on the UPS, then press  to proceed
START UP WAIT LOAD ON INV.	Indication	The system is awaiting load on Inverter
START UP PROCEDURE COMPLETE	Request for intervention	Press  to exit.

12.2.2.2 System SHUT DOWN procedure

MESSAGE NAME	MESSAGE TYPE	INFO
SHUT DOWN RESET FAULT	Request for intervention	System FAULT, reset before proceeding
SHUT DOWN EPO ACTIVE	Indication	Procedure not possible while EPO is active
SHUT DOWN OPEN QS3 SWITCH	Request for intervention	Open Bypass switch QS3
SHUT DOWN TRANSFER LOAD TO RES	Request for intervention	Transfer load to Res. by pressing 
SHUT DOWN WAIT LOAD ON RESERVE	Indication	System is awaiting load on Reserve
SHUT DOWN ON UPS THEN PRESS BUZZER	Request for intervention	Perform parallel UPS shutdown procedure and press  to proceed
SHUT DOWN OPEN QS4 SWITCH	Request for intervention	Open output switch QS4
SHUT DOWN OPEN QS2 SWITCH	Request for intervention	Open Reserve switch QS2
SHUT DOWN PROCEDURE COMPLETE	Request for intervention	Press  to exit.

12.2.2.3. System MANUAL BYPASS procedure

MESSAGE NAME	MESSAGE TYPE	INFO
MANUAL BYPASS RESET FAULT	Request for intervention	System FAULT, reset before proceeding
MANUAL BYPASS EPO ACTIVE	Indication	Procedure not possible while EPO is active
MANUAL BYPASS WAIT RESERVE OK	Indication	System awaiting Reserve OK
MANUAL BYPASS TRANSFER LOAD TO RESERVE	Request for intervention	Transfer load to Reserve by pressing 
MANUAL BYPASS WAIT LOAD ON RESERVE	Indication	System awaiting load on Reserve
MANUAL BYPASS CLOSE QS3 SWITCH	Request for intervention	Close Bypass switch QS3
SHUT DOWN ON UPS THEN PRESS BUZZER	Request for intervention	Perform parallel UPS shutdown procedure and press  to proceed
MANUAL BYPASS OPEN QS4 SWITCH	Request for intervention	Open Reserve switch QS4
MANUAL BYPASS OPEN QS2 SWITCH	Request for intervention	Open Output switch QS2
MANUAL BYPASS PROCEDURE COMPLETE	Request for intervention	Press  to exit.

12.2.2.4. System RETURN FROM BYPASS procedure

MESSAGE NAME	MESSAGE TYPE	INFO
RETURN FROM BYPASS RESET FAULT	Request for intervention	System FAULT, reset before proceeding
RETURN FROM BYPASS EPO ACTIVE	Indication	Procedure not possible while EPO is active
RETURN FROM BYPASS CLOSE QS2 SWITCH	Request for intervention	Close Output switch QS2
RETURN FROM BYPASS CLOSE QS4 SWITCH	Request for intervention	Close Output switch QS4
START UP ON UPS THEN PRESS BUZZER	Request for intervention	Perform parallel UPS start up procedure and press  to proceed
RETURN FROM BYPASS WAIT LOAD ON RESERVE	Indication	System is awaiting load on Reserve
RETURN FROM BYPASS OPEN QS3 SWITCH	Request for intervention	Open Bypass switch QS3
RETURN FROM BYPASS TRANSFER LOAD TO UPS	Request for intervention	Transfer load to Inverter by pressing 
CHECK UPS FAULT THEN PRESS BUZZER	Request for intervention	Check if any FAULTS are active on the UPS, then press  to proceed
RETURN FROM BYPASS WAIT LOAD ON UPS	Indication	System is awaiting load on Inverter
RETURN FROM BYPASS PROCEDURE COMPLETE	Request for intervention	Press  to exit.

12.3. Parallel operation

Switching to ONLINE operation:

- ▶ Switch ON the Inverters of all the UPS, one after the other, by pressing and holding the control panel Inverter Start button for 2 seconds.

Once they are all switched ON, the inverters of the UPS units synchronise and take over the load. The UPS is now in ONLINE operation.

Switching from ONLINE to BYPASS operation:

- ▶ Switch OFF the Inverters of all the UPS, one after the other, by pressing and holding the control panel Inverter Stop button for 2 seconds (see para 10.2.2. on page 84).

Once they are all switched to OFF, all inverters switch off and all bypasses switch on.

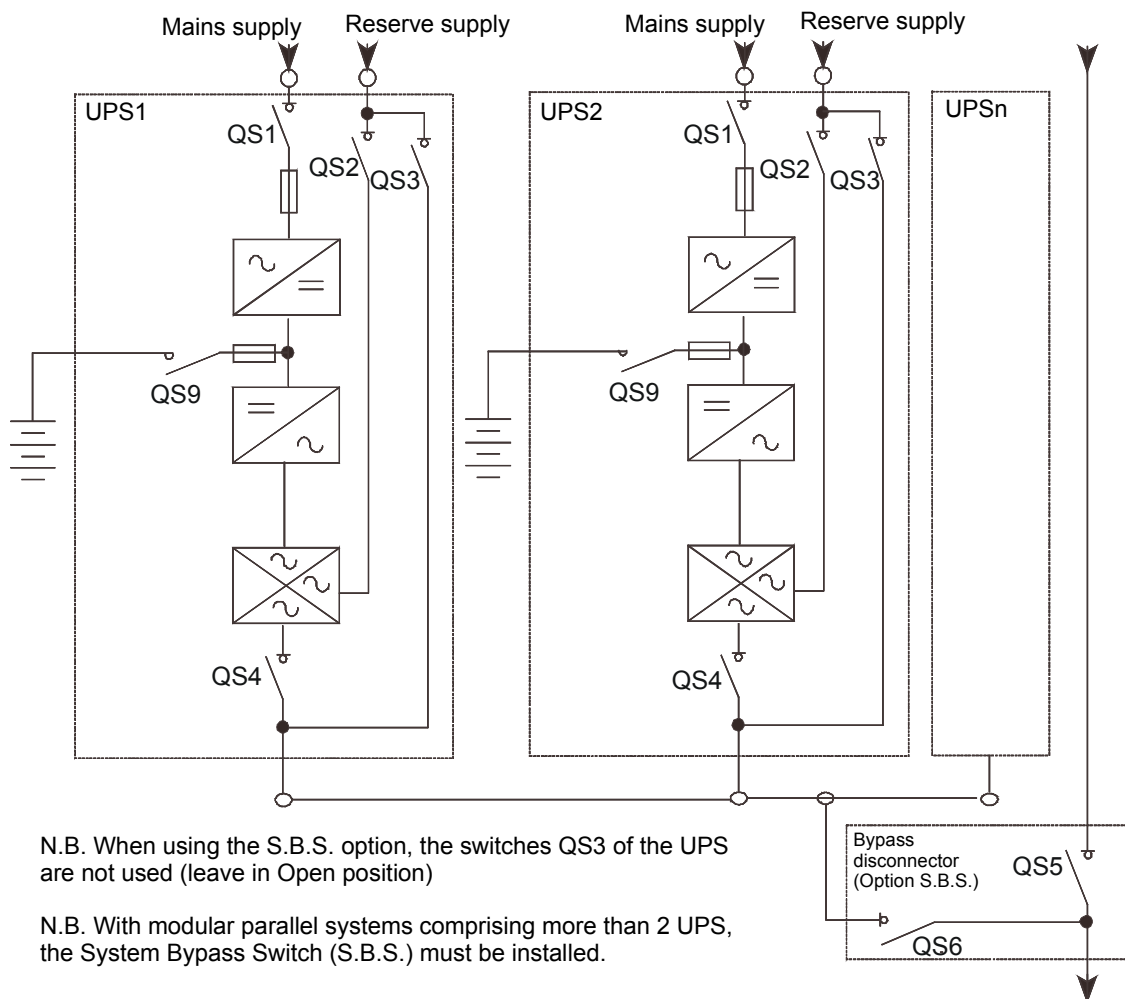


Warning

The external service bypass may only be connected in bypass operation. Doing so during ONLINE operation may damage UPS and connected loads.

12.3.1 System configuration

Figure 56 - Connections for modular parallel system



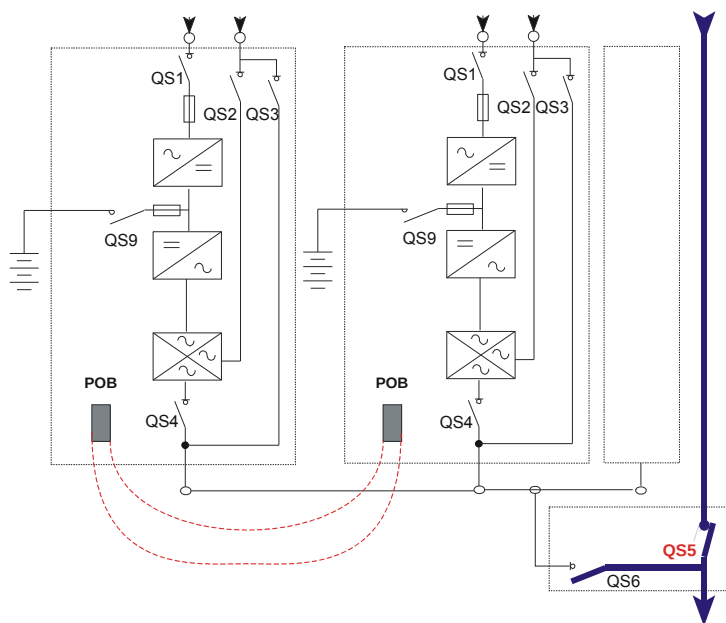
12.4. Guided procedure



Notice

THE S.B.S. PROCEDURES MAKE REFERENCE TO THE SWITCHES QS5 AND QS6; THESE SWITCHES ARE LOCATED ON THE S.B.S., AND NOT ON THE INDIVIDUAL UPS, THEREFORE THEIR POSITION AND STATUS ARE NOT INDICATED ON THE UPS DISPLAY

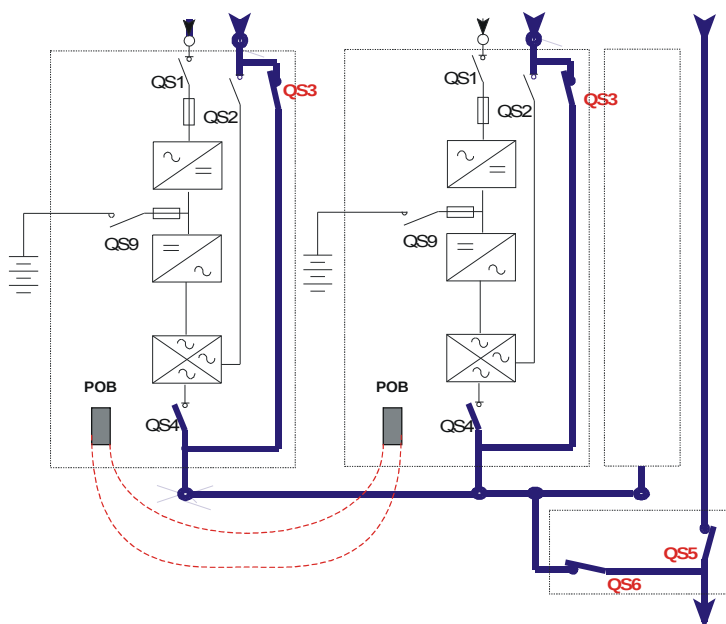
12.4.1 Initial start up - with SBS



Step 1:

The Load is supplied via the external manual Bypass (SBS) QS5

- Close bypass switch **QS3** on each Unit
- Close system output switch **(SBS) QS6**

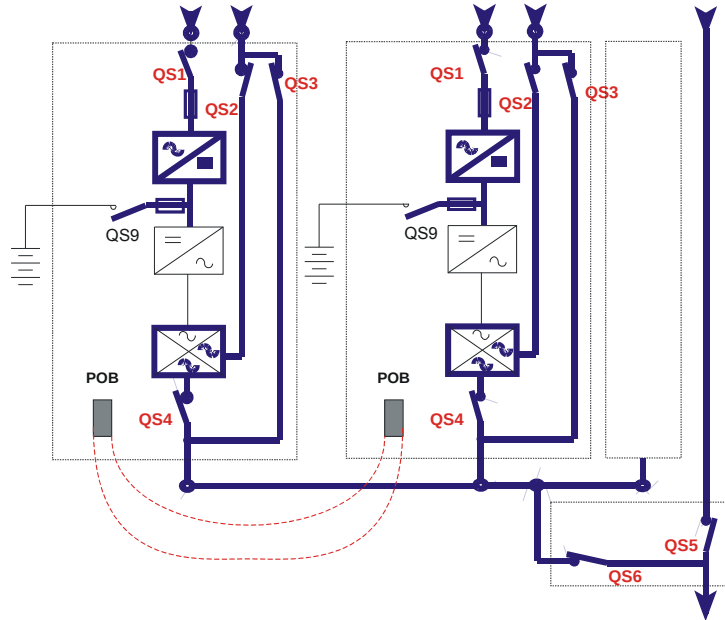


Step 2:

On each UPS:

- Close Reserve switch **QS2**
- Close Input switch **QS1**
- Output switch **QS4**

The Load is still supplied via the manual Bypass, while the rectifiers and Reserve supplies of the individual UPS are connected to their corresponding supply lines.



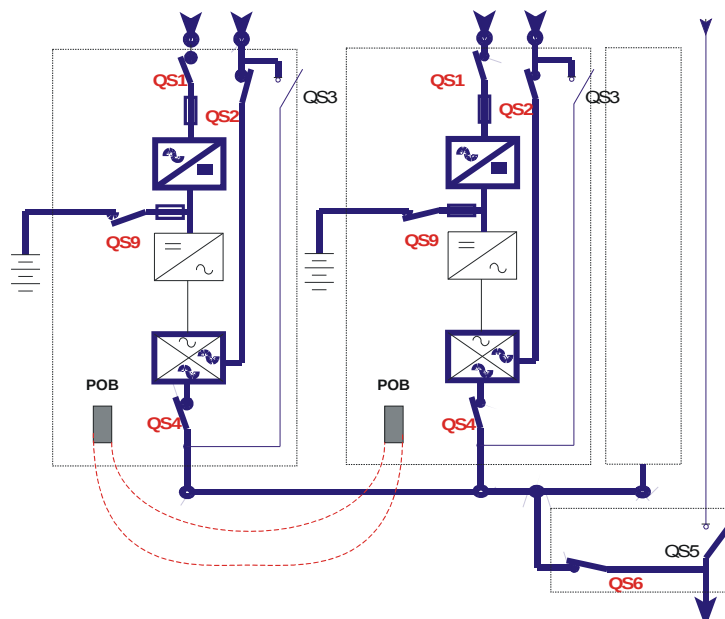
Step 3:

Check that the battery-charger voltages on the UPS side of the battery breakers are the same polarity as the those on the battery side of the breakers.

When the bypasses are ready the messages "LOAD ON BYPASS" and "BATTERY BREAKER OPEN" are displayed.

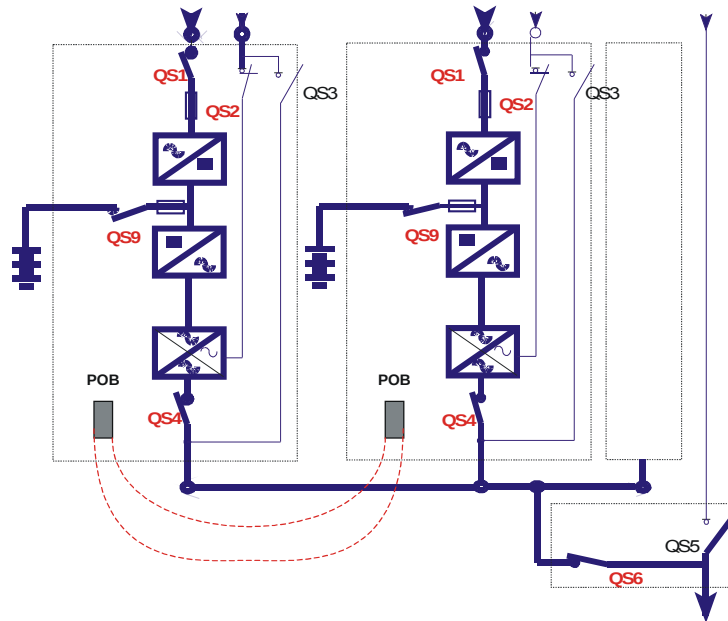
- Close each UPS battery isolating switch **QS9**
- Message "**BATTERY BREAKER OPEN**" is cancelled
- Open system by-pass switch (**SBS**) **QS5**
- Open each UPS Bypass switch **QS3**
- Message "**LOAD ON BYPASS**" is cancelled

The load now receives its supply via the UPS Static switches.



Step 4:

One at a time, press and hold for at least two seconds the Inverter Start buttons on the control panel (see para 9.1. on page 71) of each UPS. Once the last Inverter has been started they will all go on line ("LOAD ON INVERTER") and the Load will be supplied by the UPS Inverters.



12.4.2. Uncoupling an individual UPS from a parallel system

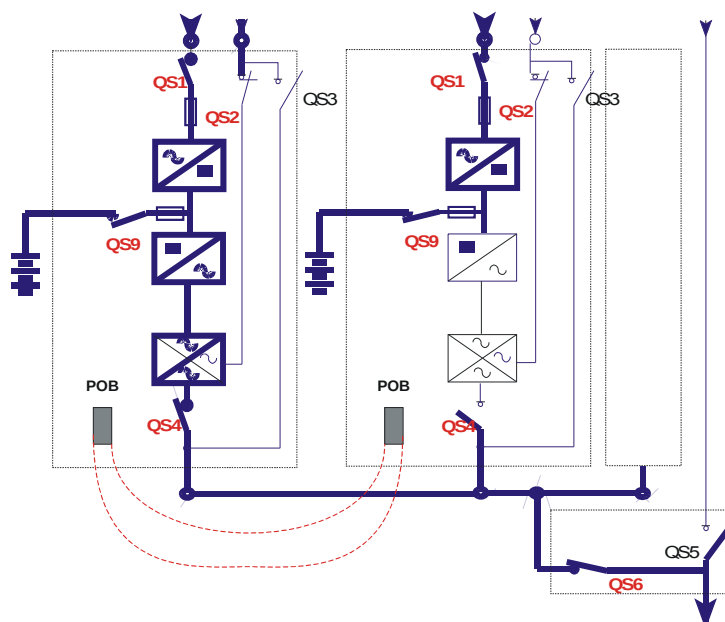
The procedure for uncoupling an uninterruptible power supply from the configuration (for maintenance purposes, for example) is described below. In this example UPS No. B is decoupled, leaving No. A to supply the load.

N.B. This procedure is valid for redundant parallel systems consisting of up to 2 UPS only; for more information contact CHLORIDE Technical Support.

Step 1:

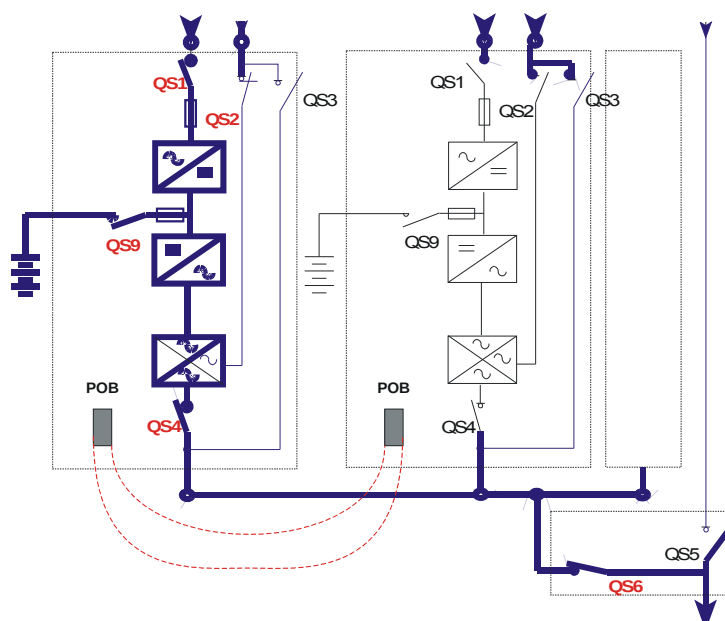
- Open output switch **QS4** of UPS B

The message "**OUTPUT SWITCH OPEN**" is displayed



Step 2:

- Open UPS B Reserve switch **QS2**
- Open UPS B battery isolating switch **QS9**
- Open UPS B Input switch **QS1**



13. I/O FUNCTIONS

The UPS in the 90-NET series are equipped with a program capable of managing a certain number of factory-installed input/output functions, which allow the User to adapt the UPS to his own needs, taking advantage of the input or output contacts available on the UPS terminal board. For some of these a message is displayed on the LCD. The following is a description of each function together with the number of Input/Outputs used. A series of Input and Output functions can also be configured at the interfaces X7 and X8, using PPVis (see para 13.7. on page 138).



Notice

Each function is identified by a letter (A, B etc.) This is necessary since the functions are identified by these letters on the UPS Display.

13.1. List of Individual functions for single and modular parallel UPS

	Function name	Description	Inputs used	Outputs used
A	Common vented (wet) batteries.	The controls for battery tests or rapid charging are transmitted or received through three input and three output contacts for UPS that have batteries in common.	2	2
B	Common VRLA (sealed) batteries.	The controls for battery tests are transmitted and received through two input and two output contacts for UPS that have batteries in common.	1	1
C	Harmonic Filter Open	This function should be enabled when the Input Filter is fitted, it provides the "HARMONIC FILTER OPEN" alarm message at the rectifier stage.	1	0
D	Not Used			
E	Fan (ON-OFF) in battery compartment	A contact is activated to control a fan in the battery compartment, which operates as follows: 1) It turns on when a set temperature threshold is exceeded (default 40°C) and will remain on for a set minimum time (default 1 hour). 2) For batteries with rapid charging function, the contact is activated during this process and will be kept on for an adjustable additional minimum time (default 1 hour).	0	1
F	Battery fuse monitor	When the input is active, the message "BATTERY FUSE BLOWN" will appear on the battery alarm page.	1	0
G	Battery compartment overheated	A contact is activated when a temperature threshold set by the customer is exceeded. The default setting is 40°C.	0	1
H	Battery temperature outside tolerance	A contact is activated when the temperature is outside normal operating limits (0°-40°C)	0	1
I	Battery earth fault output	When this alarm is activated, with the rectifier off or with a UPS included in an isolated system, the message "INSULATION FAILURE" appears on the battery alarm page and an output contact is activated.	1	1
J	EPO Input	When this alarm is activated the rectifier and inverter are switched off and both reserve and inverter static switches are OPEN – the message "EPO ACTIVE" is displayed in any page. In this condition the load is no longer supplied and the UPS control boards are supplied by the battery.	1	0
K	EPO Output	This function copies the EPO Input status onto an output, which can then be used to open a circuit breaker downstream of the UPS to isolate the load.	0	1
L	Input earth fault	When this input is activated the message "INSULATION FAILURE" appears on the rectifier alarm page.	1	0
M	UPS service active	Detects when the UPS front panel is open. When this input is activated, the message "UPS SERVICE ACTIVE" also appears on the system alarm page.	1	0

O	Output earth fault	When this input is activated the message "INSULATION FAILURE" appears on the load alarm page.	1	0
P	Reserve input transformer protection	When this input is activated the message "RES. TRANSF. PROTECT" appears on the reserve alarm page.	1	0
Q	Primary input transformer protection	When this input is activated the message "MAINS TRANSF. PROTECT" appears on the rectifier alarm page.	1	0
R	SBS Output switch open	In systems with optional SBS, this function detects the status of the System Output switch. The message "SYSTEM OUTPUT SW OPEN" is displayed on the load alarm page.	1	0
S	Insufficient Ventilation	When this input is activated the message "INSUFF. VENTILATION" appears on the system alarm page.	1	0
T	Load on Reserve	Active when the load is supplied from the Reserve	0	1
V	Extern Synchronisation system fault	An output contact is activated when an external synchronisation system fault is present. The message "SYNCHRONIZAT. FAULT" is displayed on the system alarm page.	0	1
X	Backfeed Protection	When this input is activated, the message "BACKFEED PROTECTION ACTIVE" appears on the reserve alarm page.	1	1
Y	External Battery	This input controls the external battery breaker when the external battery option is installed. The external breaker modifies the overall battery breaker status in the internal logic.	1	0
Z	Hydrogen present	When this alarm is active the battery charger is inhibited and the message "BATT. CHARGE INHIBIT" is displayed in the battery alarm page.	1	0
AA	Inverter Overload	This output is active with inverter running, each time the load exceeds the overload threshold defined by the inlet air temperature	0	1
AB	Load on Inverter	This output is active when the load is on the conditioned line	0	1
AC	Inverter synchronised	This output is active when the inverter is synchronised with the reserve line and there is no delay when switching to the direct line	0	1
AD	Rectifier running	This output is active when the rectifier is on (<i>charger on input</i> high from the rectifier controller board)	0	1
AE	Summary alarm	This output is active when there is an active alarm in the system (WARNING or FAULT)	0	1
AF	Shutdown imminent	This output is active when there is an imminent shutdown warning active on the CU4 (WARNING 10)	0	1
AG	Battery charging	This output is active when the battery charging current is greater than the parameter PNU 626-i03 for more than 10s.	0	1
AH	Rectifier fault	This output is active each time there is a fault on the rectifier	0	1
AI	Inverter fault	This output is active each time there is a fault on the inverter	0	1
AJ	Inverter over-temperature	This output is active when the inverter overtemperature threshold is reached (CU FAULT 33)	0	1
AK	Battery discharging	This output is active when the battery is not charging and its voltage falls below the parameter PNU 625-i06	0	1
AL	Battery fault	This output is active when there is a battery fault active	0	1
AM	Mains failure	This output is active each time a primary supply fault occurs	0	1
AN	Service bypass	This output is active when the service or system bypass switches are closed	0	1
AO	Inverter off	This output is active when the inverter is off. "Inverter off" is a specific state, and does not include Inverter fault: when there is an inverter fault, the inverter is switched off, but the indicated state is "Inverter fault" and not "Inverter off"	0	1
AP	Battery disconnected	This output is active when the battery switch is open	0	1
AQ	Reserve fault	This output is active when there is a fault on the reserve line	0	1
AR	Generic input/output	This output is active when the input is active	1	1

13.2. List of individual COC functions

	Function name	Description	Number of inputs used	Number of outputs used
A	E.P.O. Input	When the EPO input is active the local Reserve Static is opened. The EPO message appears in all stage windows.	1	0
B	E.P.O. Output	When the EPO output is present and output contact is activated, which drives an external relay, downstream of the Output	0	1
C	Output earth fault	When this input is activated the message "INSULATION FAILURE" appears on the load alarm page.	1	0
D	Reserve input transformer protection	When this input is activated the message "RES. TRANSF. PROTECT" appears on the reserve alarm page.	1	0
E	COC service active	When this input is activated the message "COC SERVICE ACTIVE" appears in the system alarms page, if the unit front panel is open	1	0
F	Heatsink over temperature	If this function is enabled, an output contact is activated when the heatsink over temperature sensor is active.	0	1
G	Reserve Fuse Blown	Active only on 1600/3200/4000A ratings When this input is activated, the message "RESERVE FUSE BLOWN" appears on the reserve alarm page, and the reserve line is disabled	1	0
H	Load on Reserve	This function, which is enabled as a default setting, sets the related output to 1 when the Load is supplied from the Reserve	0	1
I	Load on UPS	This function sets the related output to 1 when the Load is supplied from the UPS Inverter.	0	1
J	Inhibit Local Retransfer Command	The COC transfers the Load to the Reserve by means of an input contact. While this command is enabled, the transfer push-button is disabled, thus inhibiting load transfer.	1	0
K	Backfeed Protection	When this input is activated, the message "BACKFEED PROT. ACTIVE" appears in the Reserve alarm page, and an output is activated	1	1
L	Reserve not available	A output contact is activated when the Reserve supply is outside tolerance or unavailable (see Reserve Warning and Fault)	0	1
M	Maintenance Bypass enabled	A contact is activated when the static switch is on Reserve and the Reserve switch is closed. This function is used to enable the operation of an external bypass circuit breaker.	0	1
N	Reserve Maintenance Breaker Open	Opens the Reserve Maintenance Breaker so that the Reserve supply is not available, even if within tolerance. The load transfer push-button is disabled and the message "RES. MAINTEN. BRK. OPEN" appears in the Reserve stage.	1	0

13.3. I/O Function setting via PC terminal

The I/O Function configuration, originally managed through the old LCD, can now be effected also through the Terminal PC connected to the display board using the optional RS232 board (P/N. 15B10808G1).

This generates a new page on the terminal that will be used as an interface to enable the I/O function. This interface has to be linked to the I/O Function manager, that, depending on the I/O board number allocated, maps the functions on the available physical I/O.

In order to preserve compatibility with the existing 90NET units, it will be possible to configure the I/O function also through the old LCD.

I/O Setup through PC Terminal interface is very similar to the I/O Setup with old 90Net LCD.

From the Terminal main page chose **F6 - Setup I/O Functions**:

```
***  TERMINAL  COMMANDS  ***

F 1  Access To Memory          F 2  Display Analog I/O
F 3  Display Digital I/O       F 4  Display Machine Status
F 5  Display Errors            F 6  Setup I/O Functions
F 7  J-BUS Settings            F 8  Reset Password

Function _
```

The following page will be:

```
--- I/O FUNCTION ---

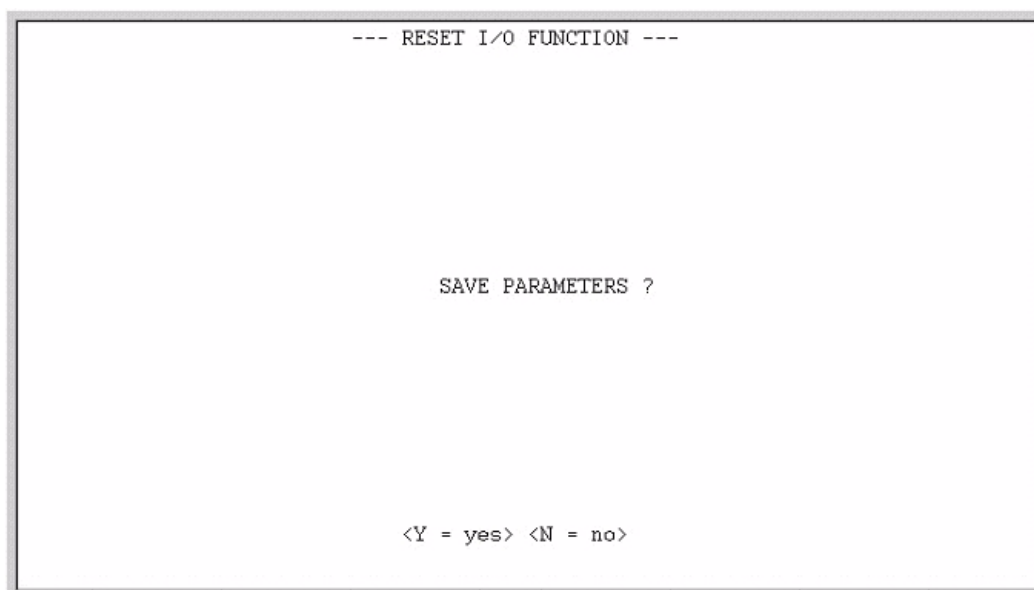
1 - Reset I/O function
2 - Set I/O function

Page

<ESC = quit>
```

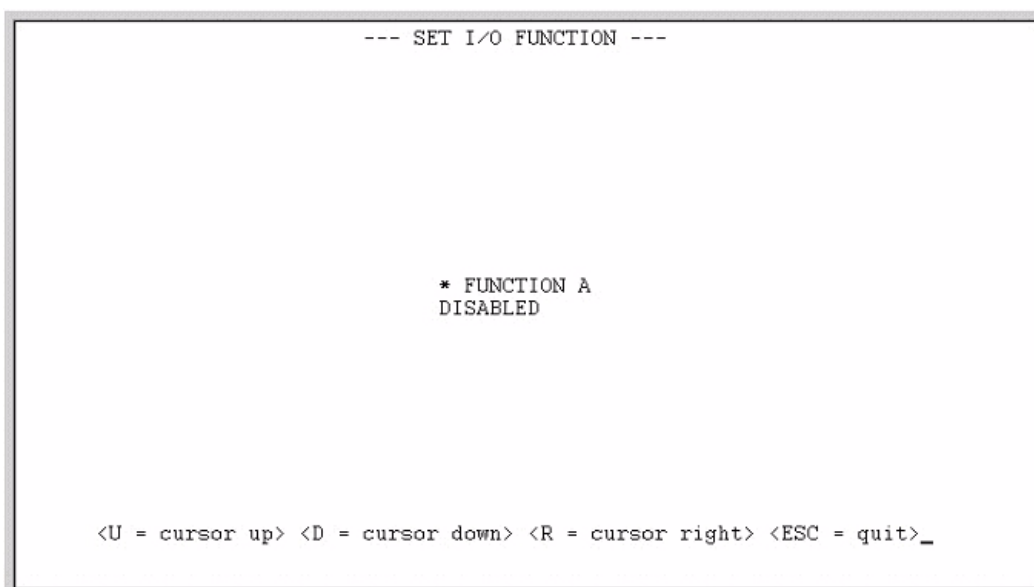
The messages have the same meaning as in the old LCD.

Choosing **Reset I/O function** you'll be asked for a confirmation:



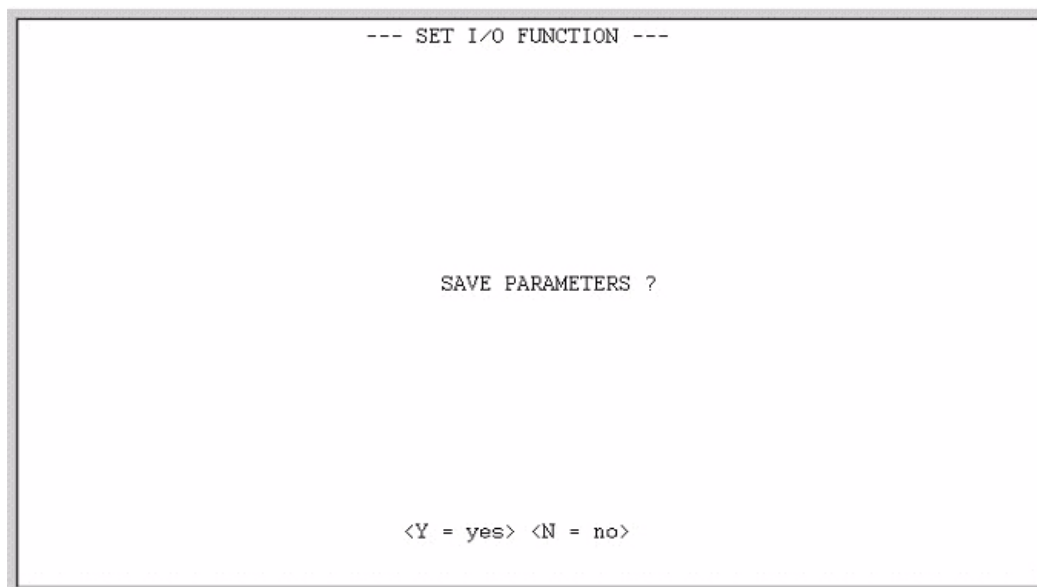
Press "Y" to confirm and "N" to abort.

Choosing **Set I/O function**, the following page will be shown:



The functions can be configured as on the old LCD, remembering that "*UP arrow*", "*DOWN arrow*" and "*RIGHT arrow*" present in the old mimic panel, have been substituted with "U" key, "D" key and "R" key.

Going down through the functions till the latter, at the end a confirmation is requested to make the changes effective:



```
--- SET I/O FUNCTION ---  
  
SAVE PARAMETERS ?  
  
<Y = yes> <N = no>
```

Terminal assignments for individual or parallel UPS - XT1

I/O CODE	Number of terminal board contact	Supply	Notes
User Input 1	9-10	standard	Factory default setting: Backfeed Protection input
User Input 2	13-14	standard	
User Input 3	19-20	standard	
User Input 4	15-16	standard	
User Input 5	17-18	standard	Factory default setting: E.P.O.
User Input 6	36-37	optional	Available only when optional 2 nd I/O board is installed
User Input 7	40-41	optional	
User Input 8	38-39	optional	
User Input 9	42-43	optional	
User Output 1	3-4-5	standard	Factory default setting: Backfeed Protection output
User Output 2	6-7-8	standard	
Aux. Bypass Contacts	11-12	standard	600/800 kVA ratings only
User Output 3	30-31-32	optional	Available only when optional 2 nd I/O board is installed
User Output 4	33-34-35	optional	
MBSM contacts	100-200	optional	

COC terminal assignments - XT1

I/O CODE	Number of terminal board contact	Supply	Notes
User Input 1	9-10	standard	Factory default setting: Backfeed Protection input
User Input 2	13-14	standard	
User Input 3	11-12	standard	
User Input 4	15-16	standard	
User Input 5	1-2	standard	
User Input 6	36-37	(*) optional	Available only when optional 2 nd I/O board is installed
User Input 7	40-41	(*) optional	
User Input 8	38-39	(*) optional	
User Input 9	42-43	(*) optional	
User Output 1	3-4-5	standard	Factory default setting: Load on Bypass
User Output 2	6-7-8	standard	Factory default setting: Backfeed Protection output
User Output 3	30-31-32	(*) optional	Available only when optional 2 nd I/O board is installed
User Output 4	33-34-35	(*) optional	

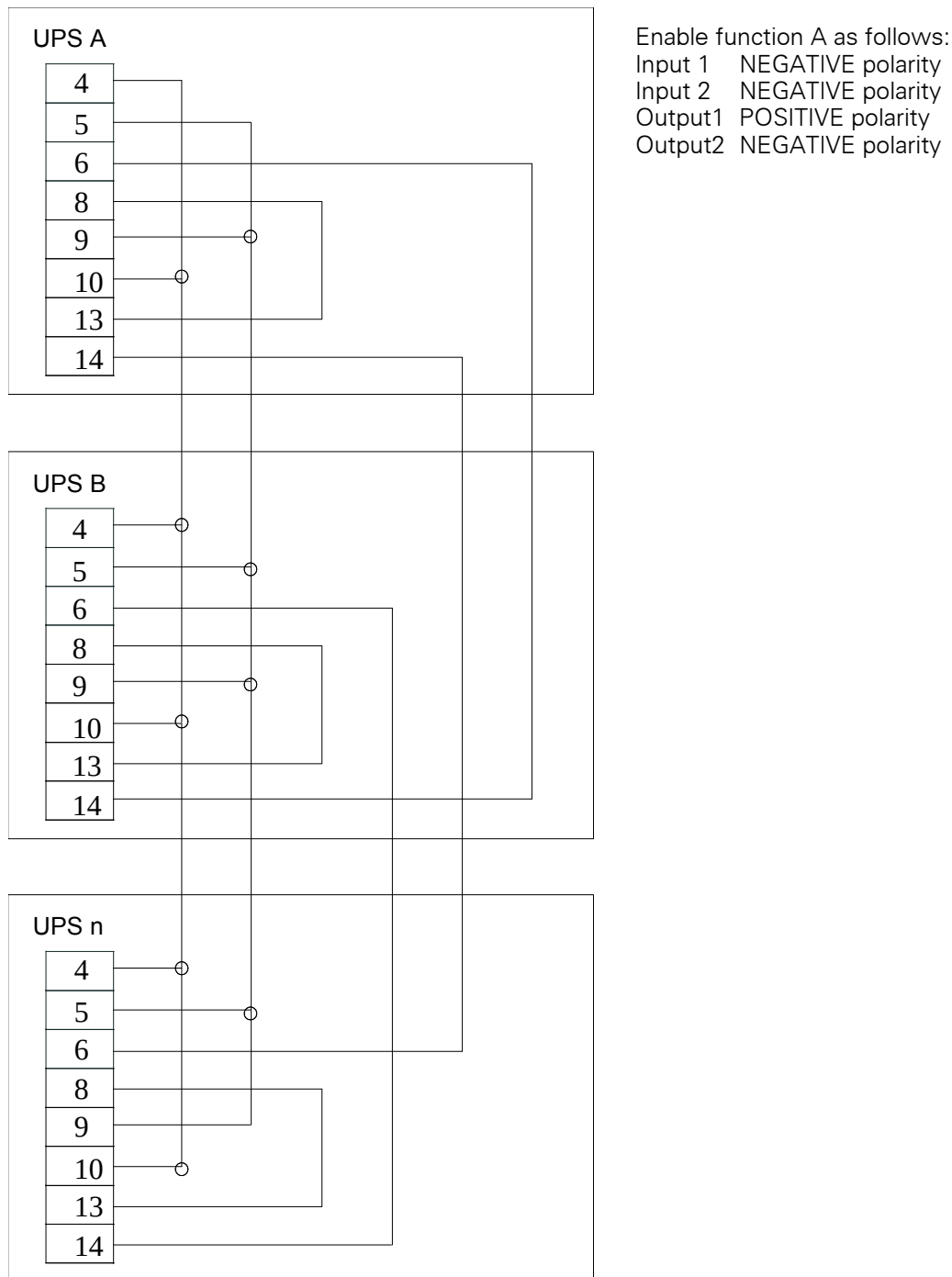
13.4. Description of function wiring with fixed terminal assignments

The input or output signals of some functions are automatically assigned to the terminals so as to always follow the same wiring pattern.

Function A for individual and Parallel UPS

This function is essential when using UPS with vented (wet) common batteries.

Wire the UPS together according to the following diagram:



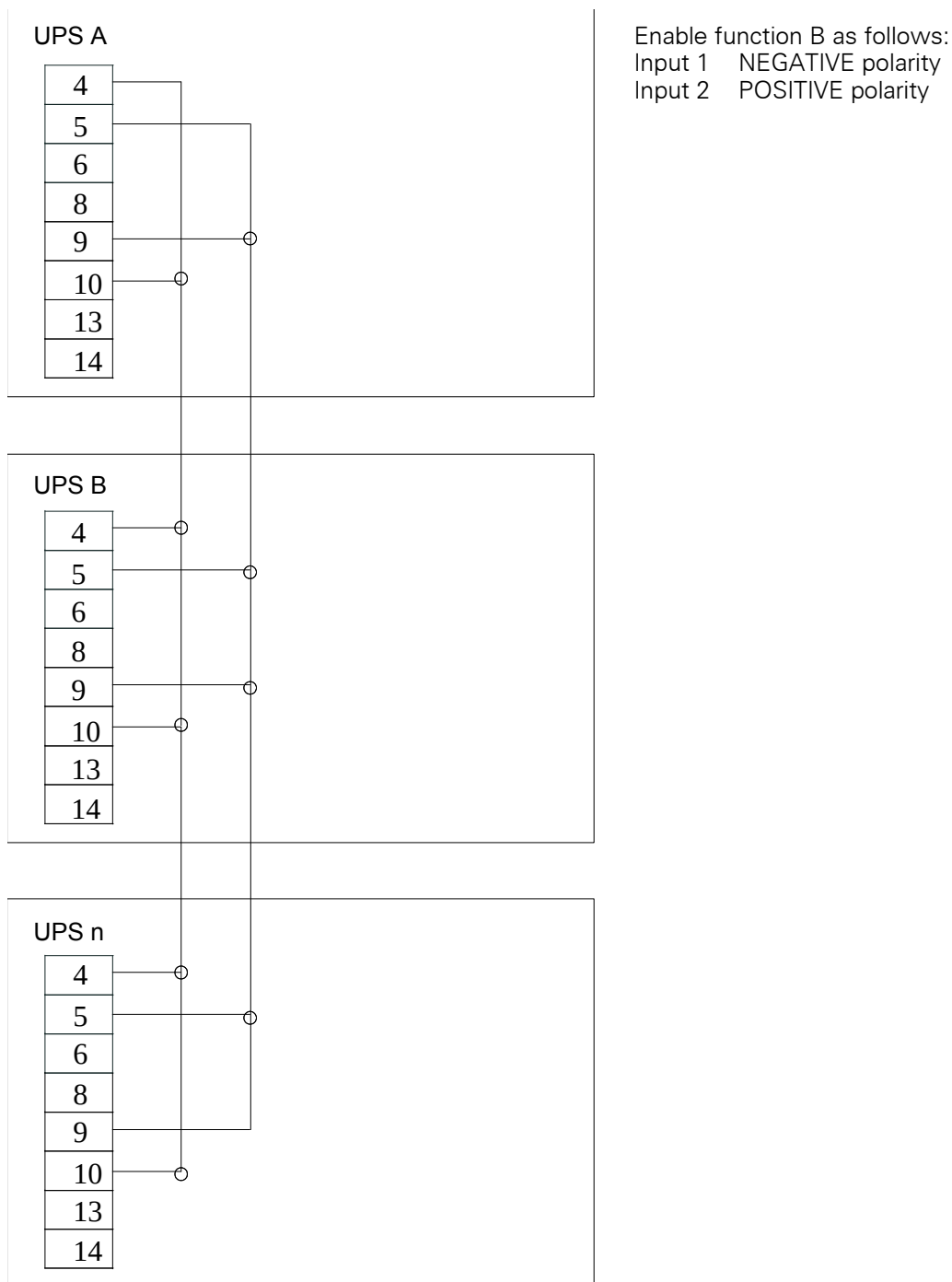
Notice

With this option it is also necessary to set the parameter via PPVIS - Rectifier Setting 630, 105 Parallel Charger Mode = 1.

Function B for individual and Parallel UPS

This function is essential when using UPS with VRLA (sealed) common batteries.

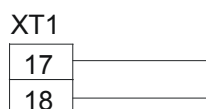
Wire the UPS together according to the following diagram:

**Notice**

With this option it is also necessary to set the parameter via PPVIS - Rectifier Setting 630, 105 Parallel Charger Mode = 1.

Function J for individual and Parallel UPS

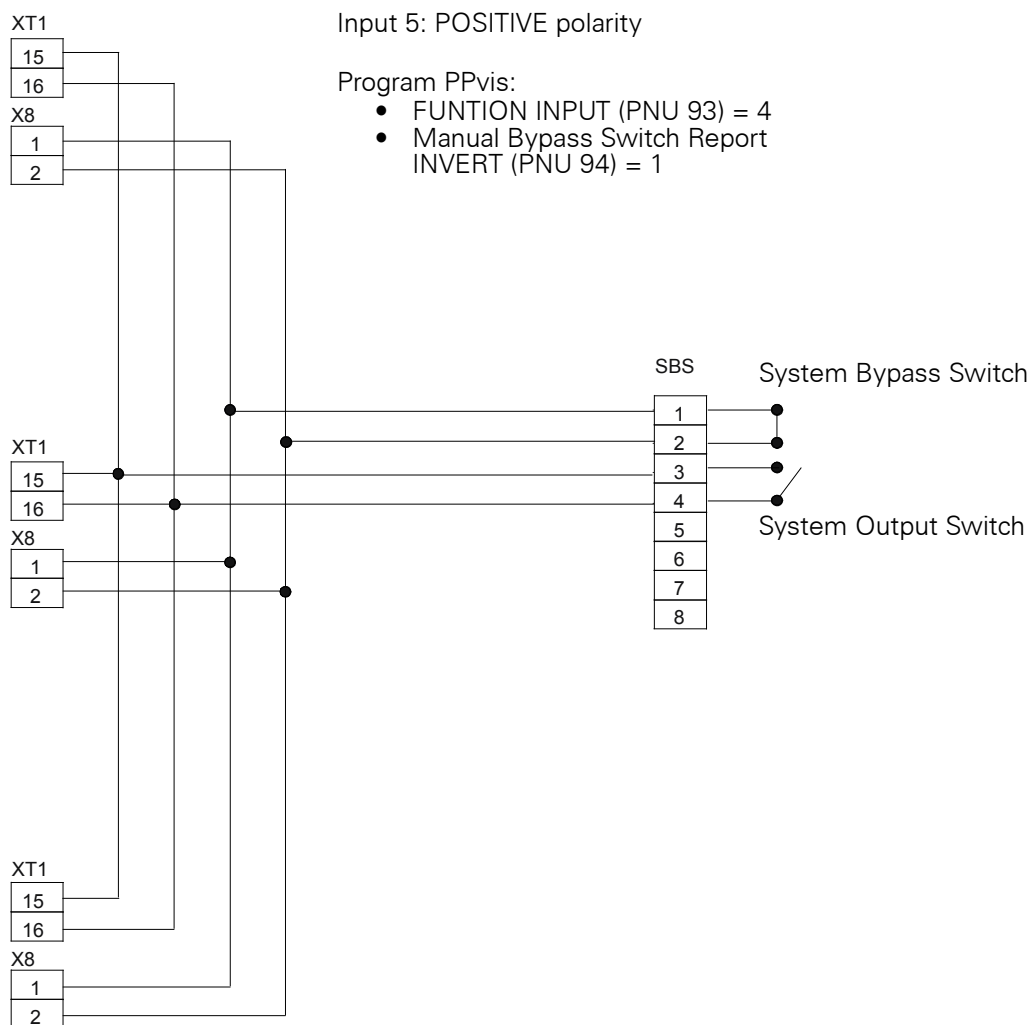
To activate the E.P.O. option, programme function J as illustrated below:



Enable function J as follows:
Input 5 POSITIVE polarity

Function R for parallel UPS with SBS

Programme Function R - SBS Output - as follows:



13.5. Electrical specifications of input/output signals

The output terminals are voltage-free; max. rating:

- 4 A/250 V AC,
- 4 A/30 V DC

Contact resistance = 100 mohm.

The Input terminals need simply to be connected to voltage-free contacts.

If the input comes from a relay, the minimum contact current of the latter must be 15 mAmp.

13.6. Table of functions

Below is a table of the functions activated on the individual or parallel UPS.

These tables are given when necessary in the inspection report that accompanies each UPS.

The options must be activated in sequence (i.e., if the options to be activated are G-C-I, activate option C, then option G, and finally option I).

The user inputs and user outputs are assigned to the terminal board using the first free terminal on the left-hand side of the table.

The INPUT polarities must be assigned keeping in mind the type of contact available to the customer and how it is recognized by the UPS software.

The following table illustrates how to set the polarity of an Input:

INPUT STATE	POLARITY	Software CONDITION	Type of CONTACT
CLOSED	POSITIVE	OFF	Normally Closed (NC)
OPEN	POSITIVE	ON	Normally Closed (NC)
CLOSED	NEGATIVE	ON	Normally Open (NO)
OPEN	NEGATIVE	OFF	Normally Open (NO)

The OUTPUT polarities must be assigned keeping in mind what condition it is given by the UPS software and what type of SECURITY the customer desires.

The following table illustrates how to set the polarity of an Input:

Software CONDITION	POLARITY	RELAY STATE	SAFETY TYPE
ON (Alarm active)	POSITIVE	ON	NEGATIVE
OFF (No alarm)	POSITIVE	OFF	
ON (Alarm active)	NEGATIVE	OFF	POSITIVE
OFF (No alarm)	NEGATIVE	ON	

13.6.1 Table of functions activated on individual or parallel UPS

USER OUTPUTS												
1			2			3			4			
XT1	3	4	5	6	7	8	30	31	32	33	34	35
	N	P	N	P	N	P	N	P	N	P	N	P
A	N	P	N	N	N	P	N	P	N	N	N	P
B	N	P	P	N	N	P	N	P	N	N	N	P
C	N	P	P	N	P	P	N	P	N	N	N	P
D	N	P	P	N	N	P	N	P	N	N	N	P
E	N	P	P	N	N	P	N	P	N	N	N	P
F	N	P	P	N	N	P	N	P	N	N	N	P
G	N	P	P	N	N	P	N	P	N	N	N	P
H	N	P	P	N	N	P	N	P	N	N	N	P
I	N	P	P	N	N	P	N	P	N	N	N	P
J	N	P	P	N	N	P	N	P	N	N	N	P
K	N	P	P	N	N	P	N	P	N	N	N	P
L	N	P	P	N	N	P	N	P	N	N	N	P
M	N	P	P	N	N	P	N	P	N	N	N	P
N	N	P	P	N	N	P	N	P	N	N	N	P
O	N	P	P	N	N	P	N	P	N	N	N	P
P	N	P	P	N	N	P	N	P	N	N	N	P
Q	N	P	P	N	N	P	N	P	N	N	N	P
R	N	P	P	N	N	P	N	P	N	N	N	P
S	N	P	P	N	N	P	N	P	N	N	N	P
T	N	P	P	N	N	P	N	P	N	N	N	P
U	N	P	P	N	N	P	N	P	N	N	N	P
V	N	P	P	N	N	P	N	P	N	N	N	P
W	N	P	P	N	N	P	N	P	N	N	N	P
X	N	P	P	N	N	P	N	P	N	N	N	P
Y	N	P	P	N	N	P	N	P	N	N	N	P
Z	N	P	P	N	N	P	N	P	N	N	N	P
AA	N	P	P	N	N	P	N	P	N	N	N	P
→												
AR	N	P		N		P	N	P	N		N	P

[illegible]

N = Negative Polarity
P = Positive Polarity



Notice

The functions on a grey background indicate options with fixed terminal assignment as described previously.

13.6.2. Table of functions activated on COC

USER INPUTS																	USER OUTPUTS																										
1		2		3		4		5		6		7		8		9		1		2		3		4																			
9	10	13	14	11	12	15	16	1	2	36	37	40	41	38	39	42	43	XT1	3		4		5		6		7		8		30		31		32		33		34		35		
																	XT1																										
																	I/O FUNCTIONS																										
A	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	XT1	A	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	
B	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N		B	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	
C	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	C	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
D	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	D	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
E	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	E	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
F	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	F	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
G	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	G	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
H	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	H	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
I	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	I	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
J	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	J	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
K	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	K	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
L	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	L	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
M	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	M	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
N	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	N	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N

N = Negative Polarity
P = Positive Polarity

**Notice**

The functions on a grey background indicate options with fixed terminal assignment as described previously.

13.7. I/O functions using interfaces X7 and X8



Notice

This procedure may be carried out by CHLORIDE authorised technical personnel only.

It is possible to configure the 4 outputs available at the interface X7, and the input available at X8 using PPVis - page [3] Contacts. (See See "PPVis" on page 143)

Figure 57 - PPVis - page [3] Contacts

Parameter	Actual Value	Set Value	Send
[51.0] Access level CU	Standard - Level 2 (2)	Standard - Level 2 (2)	←
[52.0] Function selection CU	Return (0)	Return (0)	←
[1.0] UPS condition	UPS On (H-V) - BYP (3)		
[80.0] Output contacts	Siemens (1)	Siemens (1)	←
[81.1] Output function (Output contact AK1)	Siemens OC1 (0)	Siemens OC1 (0)	←
[87.1] On Delay outp. (Output contact AK1)	0.2	0.2	←
[88.1] Off delay outp. (Output contact AK1)	0.2	0.2	←
[82.1] Invert. output (Output contact AK1)	No (0)	No (0)	←
[81.2] Output function (Output contact AK2)	Siemens OC2 (1)	Siemens OC2 (1)	←
[87.2] On delay outp. (Output contact AK2)	0.2	0.2	←
[88.2] Off delay outp. (Output contact AK2)	0.2	0.2	←
[82.2] Invert. output (Output contact AK2)	No (0)	No (0)	←
[81.3] Output function (Output contact AK3)	Siemens OC3 (2)	Siemens OC3 (2)	←
[87.3] On delay outp. (Output contact AK3)	0.2	0.2	←
[88.3] Off delay outp. (Output contact AK3)	0.2	0.2	←
[82.3] Invert. output (Output contact AK3)	No (0)	No (0)	←
[81.4] Output function (Output contact AK4)	Siemens OC4 (3)	Siemens OC4 (3)	←
[87.4] On delay outp. (Output contact AK4)	0.2	0.2	←
[88.4] Off delay outp. (Output contact AK4)	0.2	0.2	←
[82.4] Invert. output (Output contact AK4)	No (0)	No (0)	←
[108.0] SGS delay	30	30	←
[113.0] Battery Prewarning Level	2.27	2.27	←
[93.1] Function input (Input contact EK1)	No Function (0)	No Function (0)	←
[90.1] On delay input (Input contact EK1)	0.2	0.2	←
[91.1] Off delay input (Input contact EK1)	0.2	0.2	←
[94.1] Invert input (Input contact EK1)	No (0)	No (0)	←

Reading Parameter: [51.0] Access level CU

Print

03/11/2005 09:15

Use the parameters **81.1 - 81.4, 87.1 - 87.4, 88.1 - 88.4, 82.1 - 82.4** to assign the functions listed in Table 12 to the four outputs provided at the interface X7 (normally used as the AS/400 compatible Computer Relay Interface - (See "Computer Relay Interface - X7" on page 142), select polarity (*Invert output*), and set the contact activation and deactivation delays (*On delay outp.*) and (*Off delay outp.*)

Simply set the correct access levels using parameters P51.0 and P52.0:

- [51.0] Access level CU = *Experts - Level 3 (3)*
- [52.0] Function selection CU = *Commissioning - IBS (3)*

Use the parameters **93.1, 90.1, 91.1, 94.1** to assign the desired function (93.1) from Table 13 to the input provided at the interface X8 (normally used as Load Isolating Device (see para 14.2. on page 142), select polarity (P94.1), and set the contact activation and deactivation delays (P90.1) and (P91.1)

Table 12: OUTPUT Functions

P81	Function Name	Detailed Description
0	Siemens OC1-Inv. on/Summary alr	The Output is active if there is a Warning or a Fault or if Inverter isn't ON
1	Siemens OC2-Bypass On	The Output is active if the Inverter isn't running
2	Siemens OC3-Battery Low	The Output is active when Warning 10 is set (battery low)
3	Siemens OC4-Rect. fail/Line fail	The Output is active when Warning 2 or 3 is set (Primary supply fail or Bypass supply fail)
4	Online	The Output is active if the Inverter is running
5	Battery mode	The Output is active when Warning 9 is set (UPS in battery mode)
6	Bypass On	The Output is active if Inverter isn't running and Bypass static switch is ON or if Inverter isn't running and maintenance bypass switch is closed
7	Service Bypass warning	The Output is active when Warning 8 is set (maintenance bypass switch closed)
8	Self clocked	The Output is active when Inverter is running and switching to bypass is possible only with delay
9	Reserved	
10	Fault	The Output is active if there is a Fault
11	Inv-fault	The Output is active if there is an Inverter Fault
12	Bypass-fault	The Output is active if there is a Bypass Fault
13	BAC fault	The Output is active if there is a Rectifier Fault
14	Warning	The Output is active if there is a Warning
15	Reserved	
16	Battery bck time below min.	The Output is active when Warning 10 is set (Imminent end of battery autonomy time)
17	C DC-link low	The Output is active when Warning 11 is set (Battery end of discharge: Set when DC voltage < P513; it causes inverter stop. It is reset after rectifier starting + P588 - Inv. Restart delay + P634.i04 - Walk In delay. Warning: After the mains return, while warning is set, the inverter start is inhibited)
18	Overload	The Output is active when Warning 6 is set (Overload)
19	Line failure	The Output is active when Warning 2 or Warning 3 are set (Primary supply fail or Bypass supply fail)
20	RF-Mains failure	The Output is active when Warning 3 is set (Primary supply fail)
21	Bypass-Mains failure	The Output is active when Warning 2 is set (Primary supply fail)
22	Batt. temperature	The Output is active when Warning 19 is set (Battery temperature alarms)
23	Diesel gen. ON	The Output is active during a mains failure following the delay defined by P108 SGS Delay
24	U Batt./C	The Output is active when Battery Cell Voltage > P113 value.
25	Battery 25	The Output is active when Battery capacity (P21) > 12%
26	Battery 50	The Output is active when Battery capacity (P21) > 38%
27	Battery 75	The Output is active when Battery capacity (P21) > 62%
28	Battery 100	The Output is active when Battery capacity (P21) > 88%
29	Load 25	The Output is active when load percentage (P566 - Maximum Output) is > 5%
30	Load 50	The Output is active when load percentage (P566 - Maximum Output) is > 25%

Table 12: OUTPUT Functions

P81	Function Name	Detailed Description
31	Load 75	The Output is active when load percentage (P566 - Maximum Output) is > 53%
32	Load 100	The Output is active when load percentage (P566 - Maximum Output) is > 75%
33	Load 105	The Output is active when load percentage (P566 - Maximum Output) is > 105%. <i>[Threshold 105% - P565 is temperature dependent]</i>
34	Line	The Output is active when the Bypass failure undelayed alarm is set
35	General alarm	The Output is active when there is a Warning or a Fault or an undelayed Bypass/Mains failure alarm is set
36	Reserved	
37	Powerloss alarm	The Output is active when a Bypass Fault is set during Bypass operation or (Bypass is not available and Inverter is Faulty or overloaded)
38	Reserved	
39	Reserved	

Table 13: INPUT Functions

P93	Function Name	Detailed Description
0	No function	
1	Standby generator operation	The behaviour is defined by P123 setting: P123 = 0 -> Charging, inverter synchronisation and bypass disabled when SGS is in operation P123 = 1 -> Charging enabled, inverter synchronisation and bypass disabled when SGS is in operation P123 = 2 -> Inverter synchronisation enabled, charging and bypass disabled when SGS is in operation P123 = 3 -> Charging and inverter synchronisation enabled, bypass disabled when SGS is in operation P123 = 4 -> Bypass enabled, charging and inverter synchronisation disabled when SGS is in operation P123 = 5 -> Charging and bypass enabled, inverter synchronisation disabled when SGS is in operation P123 = 6 -> Inverter synchronisation and bypass enabled, charging disabled when SGS is in operation P123 = 7 -> Charging, inverter synchronisation and bypass enabled when SGS is in operation
3	Quick Stop (Faulty UPS Off)	Force Inverter OFF and Bypass OFF
4	Manual Bypass switch report	Force Inverter OFF and Bypass ON. Set WARNING 8 - info 1
7	Start battery test	Start a battery test
9	Acknowledgement	Reset Fault (fault acknowledge)
13	Stop conditioning	Cancel any running test (BATTERY, AUTONOMY, PFC)

14. INTERFACES

90-NET is equipped with

- a standard serial interface RS232 COM for data transfer protocol or modem (X6);
- an AS400 contact interface for signal exchange (X7);
- a slot for a SNMP adapter (SNMP as option) (XS3);
- a slot for adapter (e.g. LIFE.net Modem/MUX or MUX boards - See LIFE.net Software and Installation Instructions - 10H52127PAMC) (XS6);
- a service Interface configured for use with PPVIS (X3);
- an interface to provide emergency load isolating device) (X8).

The interfaces can be used for:

- Direct communication between UPS and computer
- Integration of the UPS as client into a network with centralised monitoring (SNMP)
- Transfer of operational states to external alarm systems

The necessary communication software packages and interface cables are available as options.



Notice

The slots XS6 and XS3 are interconnected with interfaces X6 and X3 respectively, if an adapter card is fitted in either slot the corresponding interface is disabled

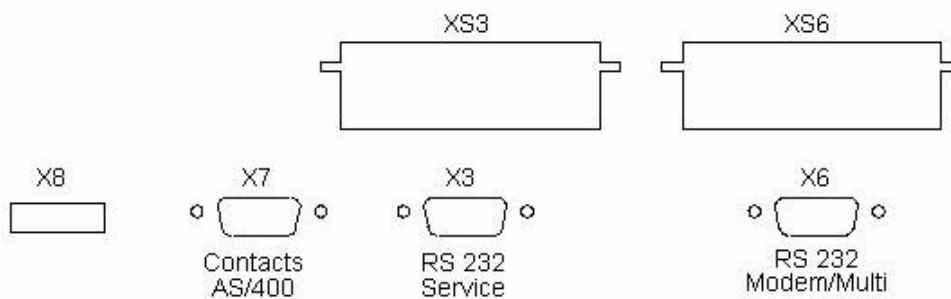


Figure 58 - Connectivity panel

The connectivity panel is located on the front left foot of the the UPS for ratings 60-200kVA, on the right side of the secondary access panel for ratings 250-500kVA, and the left side for ratings 600/800kVA:

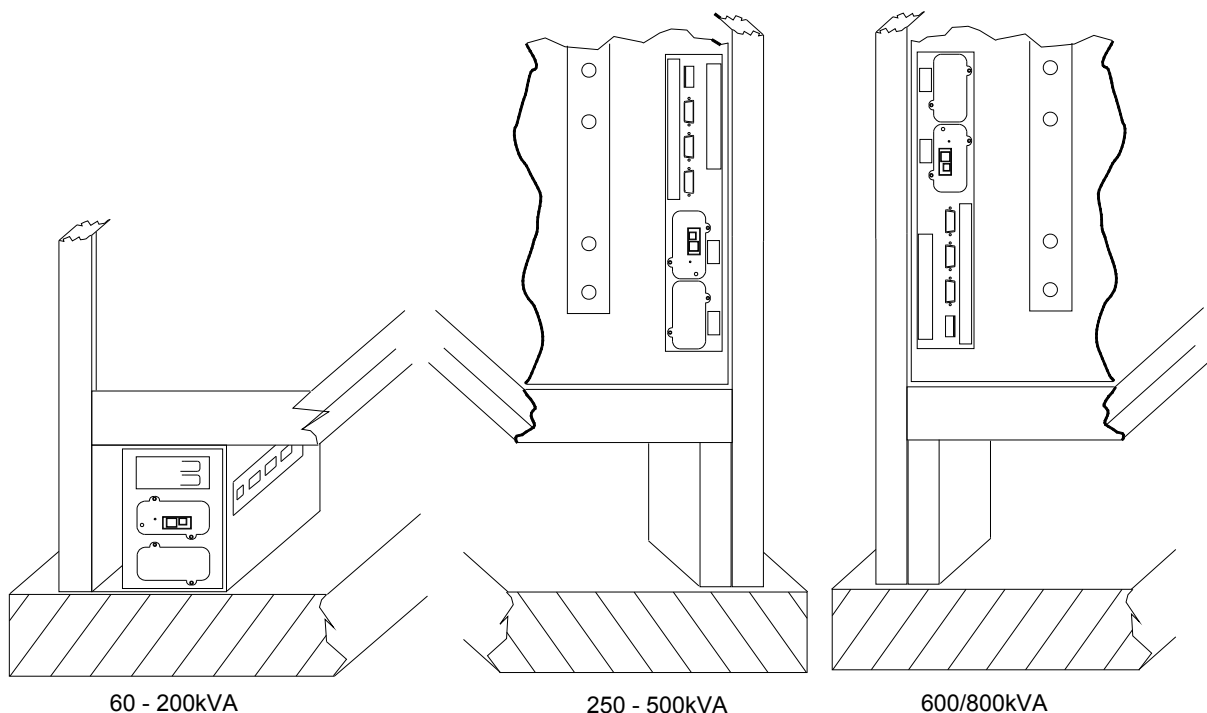


Figure 59 - Location of connectivity panel

14.1. Standard interface COM - X6

The 9-pole SUB-D male connector (pin contacts) contains the RS 232 signals.

PIN	Signal	Description
2	RxD	Receive RS232 (Rx)
3	TxD	Send RS232 (Tx)
5	Grd	Signal ground

The all interfaces are electrically isolated from all other current circuits.

14.2. Computer Relay Interface - X7

The UPS is equipped with a 9-pole D-type female connector comprising potential-free contacts and conforming to the requirements of IBM AS/400 and other computing systems.

PIN	Signal	Description
1	BYPASS ACTIVE (NC)	Bypass mode: contact between pins 6 and 5 is open
2	LOW BATTERY (NC)	Immediately prior to end of discharge (in battery mode): contact between pins 7 and 5 is open
3	SUMMARY ALARM (NC)	UPS fault, contact between pins 8 and 5 is open
4	AC FAIL (NC)	Mains failure: contact between pins 9 and 5 is open
5	SWITCH COM	Common connection for all floating connections
6	BYPASS ACTIVE (NO)	Bypass mode: contact between pins 6 and 5 is closed
7	LOW BATTERY (NO)	Immediately prior to end of discharge (in battery mode): contact between pins 7 and 5 is closed
8	SUMMARY ALARM (NO)	UPS fault, contact between pins 8 and 5 is closed
9	AC FAIL (NO)	Mains failure: contact between pins 9 and 5 is closed

The nominal rating of the potential-free contacts is 24V, 1A.

14.3. PPVis configured service interface - X3

The service interface is a 9-pin D-type female connector for RS232 serial communications configured via the PPVis interface for monitoring and control software (PPVis).

The pin functions are as follows:

PIN	Signal	Description
2	TxD	Send RS232
3	RxD	Receive RS232
5	RS232 GRD	Signal Ground for Receive and Send



Notice

The interface cables must be shielded and located away from the power cables (min. 20 cm). The shield must be connected at both ends. Control and power cables must cross at a 90° angle.

14.4. X8 - Load Isolating Device (option)

This interface may be used to install, a switch, having the properties of an Emergency Off button (i.e. Normally Closed; held open mechanically when activated), that interrupts the supply to the load in emergency conditions without switching off the UPS. The interface is a 2 pole screw terminal connector for wires up to 0.75 mm².

In order that the safety of the wiring installation comply to the European Harmonized Document HD384-4-46 S1, an Emergency Switching Device (E.S.D.) shall be fitted downstream of the UPS.

As soon as the cause for the emergency which triggered the switch is removed, switch off all UPS switches (input, output, battery disconnect, and all external battery switches) and repeat the start-up procedure as described in chapter 12 "Operating procedures".

15. STANDARD EQUIPMENT

15.1. Device parameter special setting

The following mains parameters can be set:

- nominal voltage and
- mains frequency

as well as the output parameters

- increased output voltage
- an output frequency different from input frequency and
- battery available yes / no

The adjustment will be carried out onsite or, if desired, before shipping.

15.2. Battery parameter setting

To adjust the UPS for a specific battery, the following battery parameters can be set:

- use of a temperature probe
- final charging voltage
- charging voltage temperature compensation
- various capacity values
- maximum charging current

The adjustment will be carried out onsite or, if desired, before shipping.

15.3. Special colour



Notice

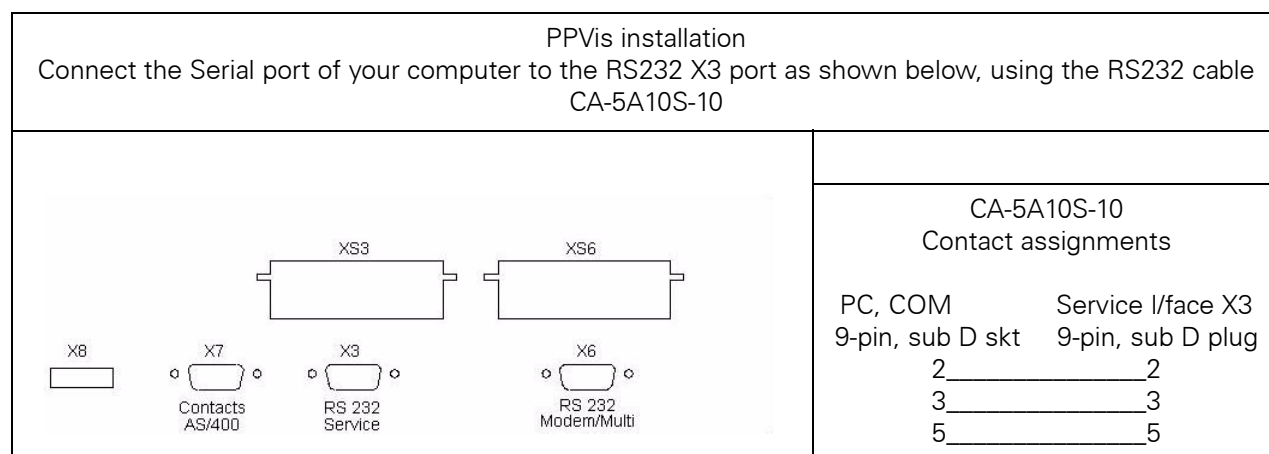
Upon request, the UPS can be painted in different RAL colours.

15.4. Further accessories

- distant signalling boards
- empty cabinets
- terminal strip interface

15.5. PPVis

PowerProtect Vis software (PPVis) allows you to operate, monitor and set the parameters of 90-NET. The screen menu, control panel, status and battery display provide clear information about the condition of your power supply, battery and UPS. The event memory records power failures, changes in operating mode and overload status together with date and time information. At start-up, or during configuration changes, the value settings for UPS and battery can easily be adapted to the operating conditions. PPVis can manage up to 32UPS units, with the capacity to monitor each unit individually.



16. OPTIONS

When options described in this chapter are added to the UPS, the data shown in the standard technical data tables may be altered. Ensure selected options are compatible on the same UPS.

16.1. Remote alarm unit

A remote alarm panel shall be available for displaying the most important individual UPS messages. Upon request, it is possible to display up to 4 UPS systems. The length of the connecting cable must not exceed 300 m.

16.2. External battery circuit breaker

This option includes a fully rated circuit breaker and an auxiliary monitoring contact. The circuit breaker is housed in a wall-mounted box and designed for rack-mounted battery systems. In addition, this circuit breaker serves as a safety element for the cross section of the power cable between UPS and the remote battery system.

16.3. Additional RFI filters (only upon request)

Feed-through RFI filters, housed in a matching cubicle, are available. Using these it is possible to reduce conducted emissions in order to meet Class B of the EN50091-2 Standard.

16.4. IP 31 with air filter cartridge

The UPS devices are also available affording the increased degree of protection IP 31. For this degree of protection, air filter cartridges are inserted into the air inlet of the power section, increasing the overall height by 200mm.

The devices are equipped with a fitted cover.

16.5. Battery leakage alarm

In conjunction with the rectifier isolation transformer option, the battery leakage monitors the DC bus insulation resistance. It is also possible to monitor the insulation resistance when the rectifier isolation is not present, by making the measurement when the input rectifier switch is open or the rectifier is off.

16.6. Battery Management Modules (only upon request)

Enhanced Battery Management Modules can be connected to the battery blocks, offering the following features:

- Measurement of each individual battery block condition by means of separate battery measuring modules (BMM)
- Analysis of each battery block by measuring the minimum and maximum voltage values.

16.7. Isolation transformer

This option consists of a double wound transformer housed in a matching cubicle. The transformer incorporates an electrostatic screen as standard. The option is used to isolate the rectifier/output/reserve from the mains AC input. For ratings of 250kVA and above, cable entry is from the top; for smaller ratings it is from the bottom. The transformer cabinets do not include switching devices. This option may significantly affect the reserve line inrush current, thereby influencing sizing of upstream protection devices. For further information please contact the CHLORIDE Technical Support; optional low inrush current isolation transformers can be provided on request.

16.8. Top cable entry

The option allows power cable entry from the top of the UPS.

16.9. Dust filters

The option improves the air inlet protection degree from IP20 to IP40 for specific applications such as a dusty environments. The filter is housed in the UPS cubicle (IP20).

16.10. Input harmonic filters for 6 pulse versions (only upon request)

The input current harmonic distortion filter mounted on the 6-pulse rectifier UPS version (available only up to 200kVA) limits THDi to less than 7% and improves the power factor for a wide range of loads and input voltage levels.

	6-pulse - %	6-pulse + 7% filter - %
5 th harmonic	29	4
7 th harmonic	5	3
11 th harmonic	7	3
13 th harmonic	1	1
17 th harmonic	3	2
19 th harmonic	1	1
Total THDi	30	7

16.11. 12 Pulse rectifier

16.11.1. 12 pulse rectifier @ THDi < 5% (optional for 60 - 200kVA, standard from 250kVA).

This version consists of two 6-pulse rectifiers phase shifted by 30 degrees. This attenuates the 5th, 7th, 17th and 19th harmonics in order to achieve a THDi of approximately 5%. The 12-pulse rectifier is housed inside the UPS cubicle. When this option is fitted (for 60 - 200kVA range), the overall AC/AC efficiency is reduced by 2.5%, the generated acoustic noise is increased by 1 dBA, the power factor in PFC Mode is reduced to 0,90 $\pm$ 0,02 and the input voltage tolerance is -11% @ 192 cells. The input inrush current is limited to < 4In.

	12-pulse - %	12-pulse + 5% filter - %
5 th harmonic	1	1
7 th harmonic	1	1
11 th harmonic	7	4
13 th harmonic	1	2
17 th harmonic	1	-
19 th harmonic	2	-
Total THDi	8	5

16.12. Multiple Bus Synchronization Module (MBSM)

The synchronisation kit is used to synchronise UPS systems, in order to ensure correct operation with CROSS system static switches. To do this, all UPS must be communicating each other. The MBSM box allows the communication of up to 6 UPS. For more than 6 UPS, cascaded MBSM boxes should be used.

16.13. Empty battery cubicle

Matching empty battery cubicles are available, these include the following components:

- Cubicle
- Disconnection device
- Fuses
- Safety panel
- Connection terminals
- UPS/battery connection cables (for adjacent installation)

Cubicles are available in three sizes:

	Width (mm)	Depth (mm)	Height (mm)	Net weight (kg)
Type A	820	858*	1780	220 $\pm$ 35
Type B	1020	858*	1780	250 $\pm$ 35

* including front handle; without handle: 830/1030 mm

16.14. Battery cubicles

The backup times which can be obtained with the battery cabinets are dependent on the battery type. For the exact values, please refer to the catalogue, the plate on the packaging of the battery cabinet or the name-plate of the battery cabinet.

16.15. Empty options cubicle

Matching cubicles are available for customised applications such as:

- Input/Output voltage matching transformers
- Customised distribution boards
- Customised applications.

16.16. Customer interface board

The number of input/output functions, can be increased by installing an additional board. These input/output functions can be used to monitor smoke, fire and water detectors, as specified by the user. Each board includes:

- Four digital inputs (from voltage free contacts)
- Two outputs - voltage free contacts (1A 30V AC/DC)

16.17. Telephone switch for LIFE.net

This telephone switch for LIFE.net allows connection via a telephone line normally used for other purposes (fax or telephone).

16.18. MopUPS Shutdown and monitoring software

The main function of the MopUPS software is the safe shutdown of the operating system in the event of a power failure. Other functions include:

- (1) Automatic actions for events-email, messages, etc.
- (2) Recording of event log and status information on files
- (3) Viewing and monitoring of UPS in real time
- (4) Programmed system shutdown
- (5) Remote monitoring of UPS connected to network server using Named Pipes or TCP/IP

16.19. ManageUPS adapter

This option includes a complete package (including slot card adapter) to enable monitoring and control of the networked UPS using TCP/IP protocol. The adapter permits:

- UPS monitoring by an NMS via SNMP.
- UPS monitoring by PC via Web Browser.
- Sending of event e-mail messages.

ManageUPS, in conjunction with MopUPS, also permits safe shutdown of the operating systems

16.20. PPVIS surveys Monitoring Software

In addition to the full monitoring capability, this powerful software connectivity tool allows complete access to the UPS configuration parameters. Therefore, the User must attend a specific training session held by CHLORIDE Service Engineers before being allowed to access PPVis.

This option provides the user with the following, essential information on connected UPS:

State indication - power flux survey

- Current state of components (UPS)
- Display of output voltage, UPS performance and load currents
- Number of power failures
- Battery cell voltage
- Available backup time

Oscilloscope - network and load conditions measurements

- Dual-carrier input/output voltage or current curve measurements.
- Flexibly defined trigger conditions that can be adapted to various events, e.g. mains failure.

Battery display - Early recognition of parasitic current effects (optional for single blocks)

- Measures the condition of each individual battery block by means of separate battery measuring modules (BMM)
- Clicking the mouse button, each battery block is analysed by measuring the minimum and maximum voltage values.

16.21. Compatibility Table

	LIFE.net	MopUPS	ManageUPS	PPVIS
LIFE.net		No	Yes	Yes
MopUPS	No		Yes	Yes*
ManageUPS	Yes	Yes		Yes
PPVIS	Yes	Yes*	Yes	

* use LIFE.net port for MopUPS

16.22. J-Bus protocol

An optional kit ensures 90-NET is compatible with the J-Bus protocol on RS485 port.

16.23. Profi Bus protocol

A Profibus-DP connection enables 90-NET to be linked to higher level automatic systems. The Profibus-DP bus system enables very fast, cyclical data exchange between higher-level systems such as Simatic S5, S7, Symadyn D, PC/PG and units in the field. 90-NET can send the following information:

- Unit status
- Alarm and fault information
- UPS output voltage levels
- Control information

17. MAINTENANCE

17.1 Maintenance intervals

For reasons of safety, we recommend that the UPS functions be checked at regular intervals, e.g. on site by CHLORIDE Customer Service. Note the corresponding handling regulations for the connected batteries. If air filter cartridges (optional) are used, the cooling air current must be checked regularly. Clean or replace filter mats if necessary.

The UPS indicates when the end of the ventilator lifetime has been reached (see table "Warning indicators"). A ventilator replacement by CHLORIDE is recommended.

17.2. Service addresses

On-site service is available world-wide. Service telephone and fax numbers can be found on the last page of this manual.

18. ENVIRONMENTAL COMPATIBILITY, DISPOSAL

18.1. Environmental concerns during development

In contrast to earlier UPS devices, the number of components has been greatly reduced through the use of highly integrated components and modular construction. As a result, energy consumption during production is reduced.

Particular attention was paid to reducing the volume, mass and variety of metals and plastics used.

Environmental compatibility was an important criterion in the selection of parts obtained from vendors.

18.2. Environmental concerns during production

Components obtained from vendors are delivered primarily in reusable packaging.

ASIC components and SMD elements are used on the flat component groups.

Production is emission free.

18.3. Environmental concerns for disposal

The device can be stripped down into recyclable mechanical components with screw and snap connections. Within the area of the EU, disposal should be carried out by a certified disposal company. In other countries local regulations must be observed.

